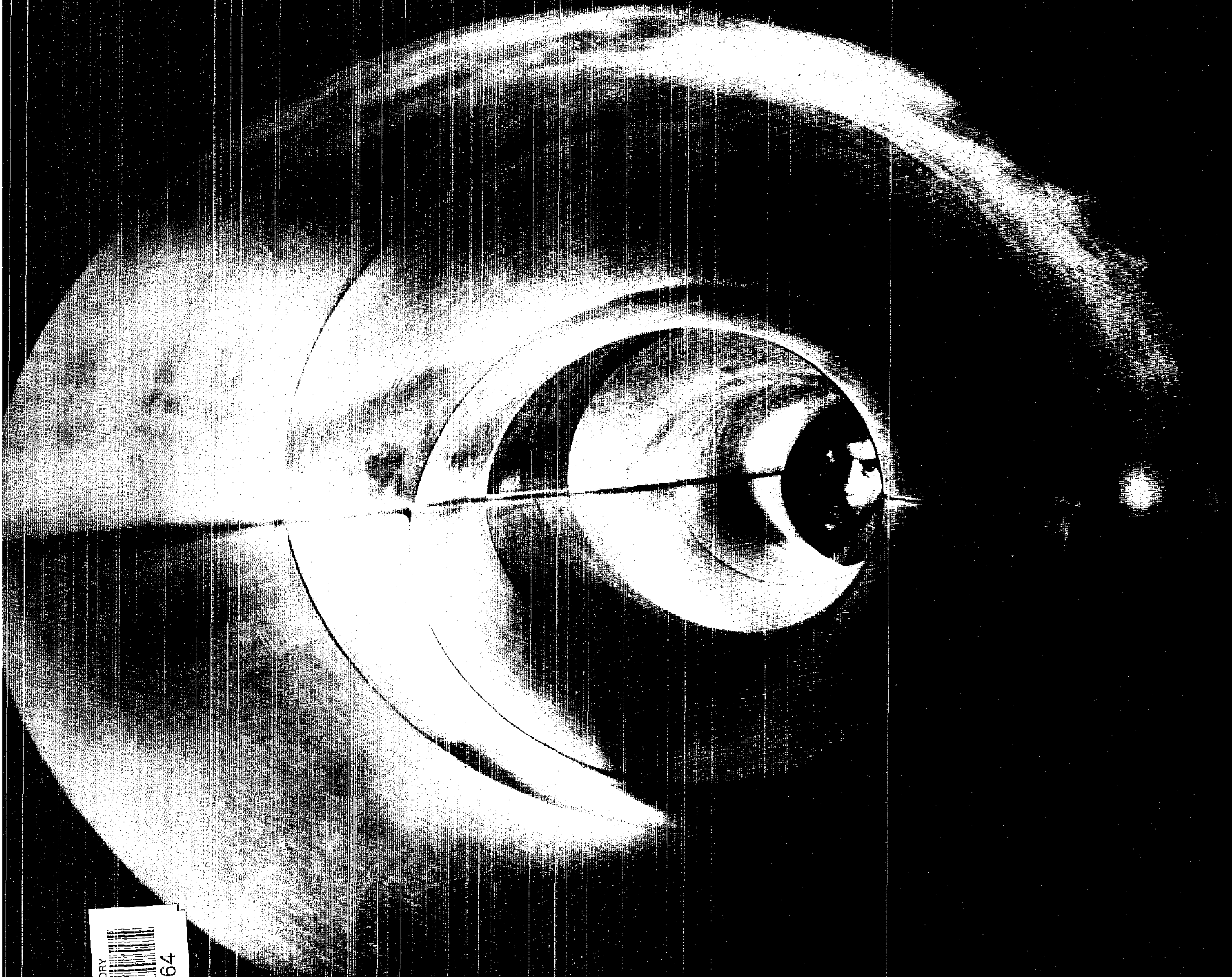
THE ATOM

Los Alamos Scientific Laboratory March-April 1975



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THE ATOM

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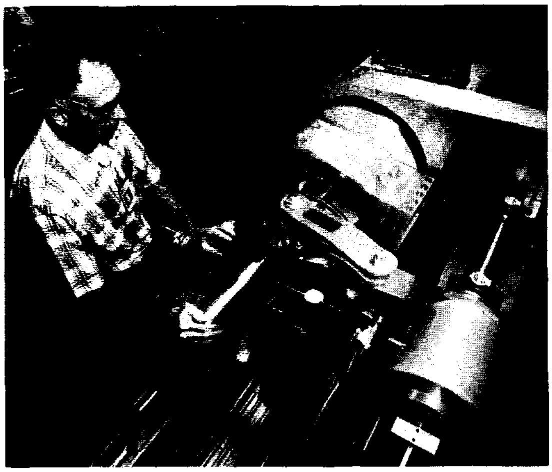
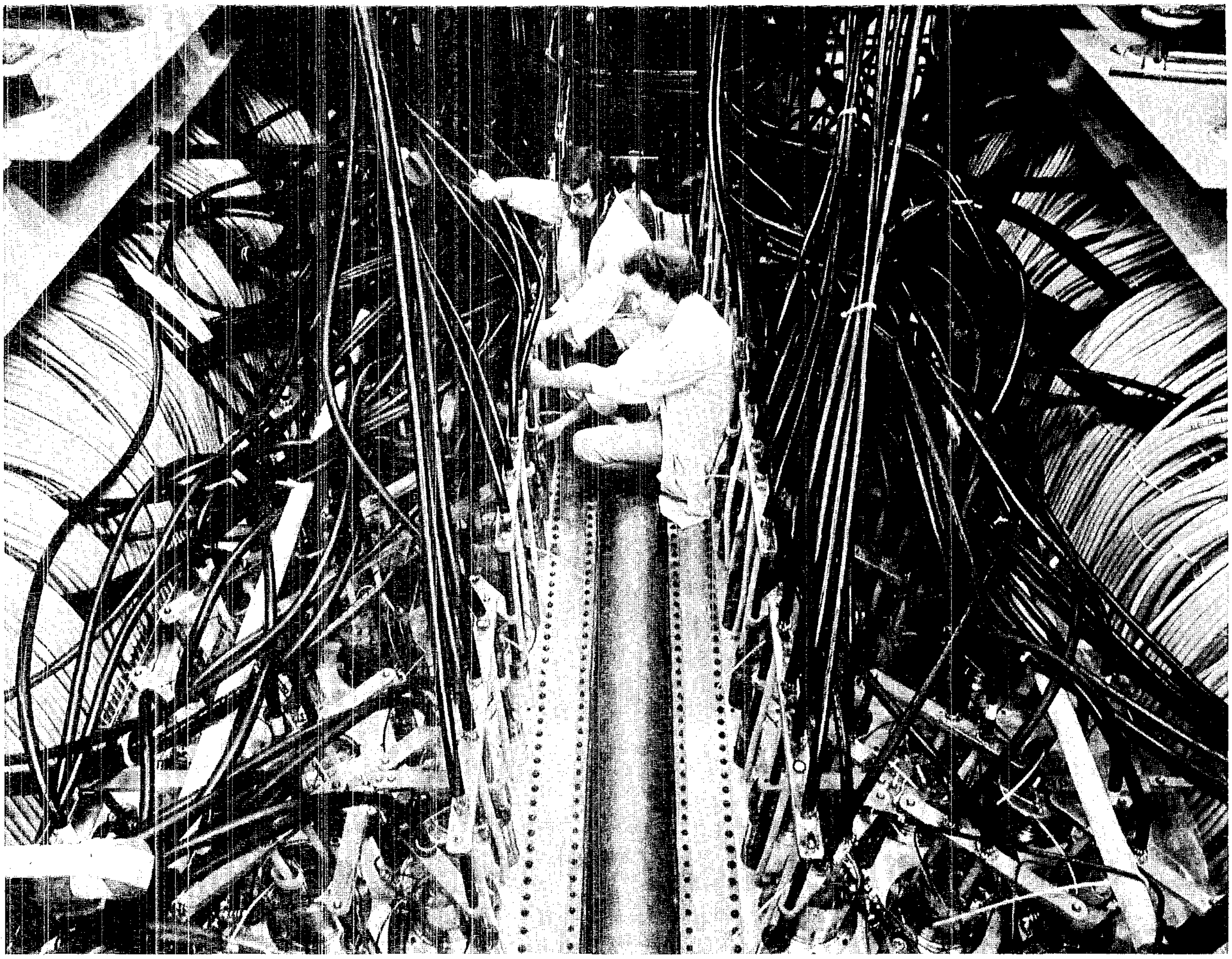
COVER

Not a chambered nautilus, but an aluminum coil for the torus of Scyllac, here framing the face of Rudy Martinez, CTR-3. Its exotic shape is calculated to compensate for the tendency of plasma compressed within it to drift toward the outer wall. For more on Scyllac, see the story beginning on the opposite page.

The Atom was not the only entity that believed the cover photograph had artistic merit. The photo, taken by Henry Ortega, ISD-7, won a Best Black and White Commercial award against 40 entries in this category in a competition sponsored by the Professional Photographers Association of New Mexico in Los Alamos from March 1st through 3rd.

Below, Robert H. Barnes, SD-5, uses an advanced type of lathe to form one of the coils.





Checking wiring on a new type of circuitry for a linear theta-pinch chamber are Jim Downing and Jose A. Garcia, both CTR-7. The device will produce "fat" plasma which will be more amenable to control than Scyllac's "thin" plasma.

SCYLLAC

a look downstream

Scyllac—impressive symbol and principal apparatus of the Los Alamos Scientific Laboratory's controlled thermonuclear research program—has been placed on a new regime. Instead of the stiff, hard plasma which it has until recently been fed, a weaker, gentler plasma has become its diet. To provide Scyllac with this blander nourishment, the field strength generated in the aluminum coils forming the toroidal chamber has been reduced from 40 kilogauss employed as of a few months ago to less than half of that amount today.

The result of easing up on the wallop administered to the deuterium gas injected into Scyllac's toroidal chamber is that the plasma thus formed responds by being less ornery in the matter of instability. As is common knowledge, at least among Laboratory personnel, controlled thermonuclear research relies on the application of magnetic force to compress and briefly contain deuterium (an isotope of hydrogen). Since the temperature of this gas—now called a plasma because electron shells have been stripped from deuterium nuclei during the compression process—far exceeds that of the sun's surface, no known substance could contain it. Thus, magnetic force is relied upon for compression and containment.

"The CTR program at LASL is anything but static. Both in its physics and its physical facilities, CTR in all its complexities is very much on the move."

From 1957 to 1968, magnetic confinement experiments were conducted in linear cylinders, simplifying the application of magnetic force, but resulting in losses as the plasma, like toothpaste from a tube, was squeezed from the chamber ends by its own pressure. Thus, Scyllac, a toroidal chamber without ends, was a milestone when completed last year, as it eliminated the end-loss problem—but in turn complicated other problems.

The central problem was the tendency of the compressed plasma to drift towards the outer wall of the chamber because that wall, being of greater circumference than the inner wall, has less magnetic pressure. This was compensated for by sculpting a chamber not in the simple shape of a bicycle inner tube, but in a complex helical shape "corkscrewing" within the torus, in effect equalizing the wall area. To carve this shape within aluminum segments of the coil, a highly sophisticated computerized milling machine and lathe are employed (see cover and inside cover).

Nonetheless, controlling the violent and abrupt tendency of the plasma confined magnetically along the torus' axis to break away from its equilibrium position and move toward the walls of the coil remains a problem. Thus, Group CTR-3, under Warren Quinn, is striving to perfect a feedback system consisting of sensors in the coils to detect when the compressed plasma begins to develop instability, and devices to administer just the right amount of force required locally to nudge the plasma back into position.

All within a time scale of tens of millionths of a second.

Self-Control

Meanwhile, in what superficially appears to be a return to the linear Scyllas of the past, Group CTR-7 under Keith Thomas is experimenting with new circuitry in a straight-tube device. By altering pulse characteristics, CTR-7 produces "fat" plasma (occupying more of the chamber than "thin" plasma).

The use of fat plasma brings a phenomenon into prominence which can be used to advantage: wall stabilization. In a Scyllac-type system, the immense energy absorbed by the plasma during compression is, in part, transformed into an electric current flowing back and forth along the plasma. This current induces a magnetic field in the metal coils. And this field acts to push the plasma back into place when it moves away from equilibrium. In a sense, the plasma has acquired self-control.

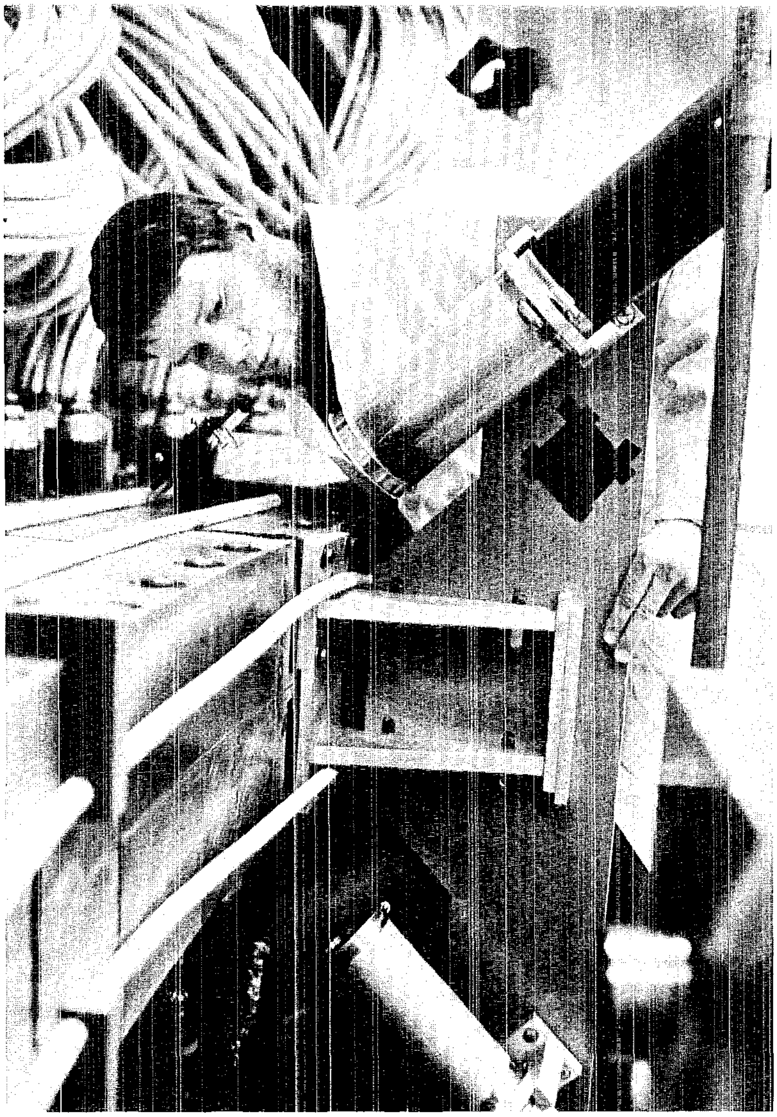
If walls alone can stabilize plasma, why develop a feedback stabilization system in addition? Unfortunately, wall stabilization does not work with perfection. The feedback system is required as a supplement. However, wall stabilization can greatly reduce demands upon a feedback control system, and the two systems together should keep the cantankerous plasma in place long enough for fusion reactions with a net gain in energy to take place.

A Look Ahead

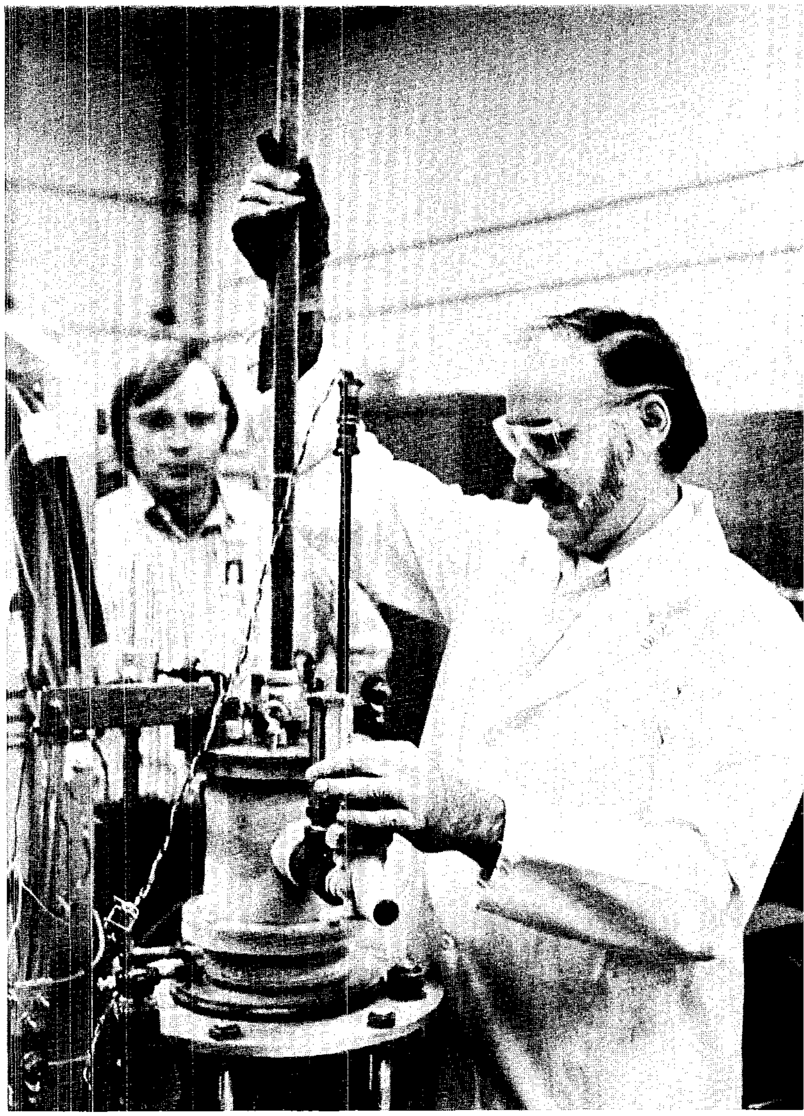
A year ago, upon the completion of Scyllac's full torus, *The Atom* recognized the milestone with a retrospective report of the history of LASL's controlled thermonuclear research from its origin in the primitive Perhapsatron of 1954, through a succession of Scylla straight-tube devices, to the present Scyllac—all under programs named Project Sherwood, Controlled Thermonuclear Research, and, more and more, as the LASL High Beta Program. ("Beta" is the ratio of plasma pressure to the confining magnetic field pressure.)

The Controlled Thermonuclear Research program has been around for so long and will be around for so much longer that, for many, it has become a LASL landmark. And like a landmark, it tends to be accepted unthinkingly as a static part of the scene.

The CTR program at LASL is anything but static. Both in its



Guthrie Miller, CTR-3, aligns a prototype sensor installed on a segment of the Scyllac torus. Several types are being tested for their ability to detect instabilities developing in confined plasma and signal a corrective pulse in tens of millionths of seconds.



Dick Buteau, CTR-9, removes wire after testing in a cryogenic chamber for possible use in superconducting magnets as John Wollan, CTR-9, watches. Such magnets will be a key part of a METS system storing energy at more than 100 times the density of today's capacitors.

"Future historians may well record that just as the path to fission power started at Los Alamos some 30 years ago, so did the path to fusion power."

physics and its physical facilities, CTR in all its complexities is very much on the move. The trail into the future starts in the present Scyllac Building and ends at Two-Mile Mesa, a presently restricted site used most recently for shock wave and laser testing.

Super Scyllac 1975-77

Even as experiments are being conducted on the present, familiar Scyllac, its days are numbered. Within a matter of months it will be torn down to be reborn, like a phoenix, in bigger and better form in the present CTR building.

New coils are being fabricated to form a bigger torus. Instead of being within the huge capacitor banks down in a "bull pit" as at present, the new torus will encircle the capacitors, coming within inches of the walls of the building.

"The bigger the circle, the more it approaches a linear device in its performance and the less we have to compensate for the plasma drifting toward the outer wall," Fred Ribe, CTR-Division leader, explains.

It is with Super Scyllac that the principles of fat plasma, wall stabilization, and feedback control will be further developed and integrated. A basically different type of circuitry will be employed to administer the shocks that accomplish heating followed by compression. More than one magnetic impulse is involved. The first shock heats the plasma and the second impulse squeezes. Heretofore, the heating shock had been less intense, the compression pulse more intense. Now the heating shock will be more intense, the compression pulse less. The net input of energy is the same, but now the plasma will be hotter with less density. CTR researchers believe this fat plasma will be less subject to violent instabilities and more amenable to both wall and feedback control.

With this "staged" mode, shock heating can be separated from compression. A separate bank of capacitors will be installed for this. The circuitry for this is simpler and less expensive—another advantage to the new approach.

CTR City

Proposed for funding in Fiscal Year 1977 is a new CTR office building including laboratories and workshops on Two-Mile Mesa. This would be the first of 3 major buildings (plus undoubtedly a number of mobile offices and other smaller support buildings) of a complex that would rival the Clinton P. Anderson Los Alamos Meson Physics Facility (LAMPF) in scope. Eventually up to 400 LASL employees would work there. The impact upon LASL—in terms of payroll, construction, etc.—would be substantial.

As the building nears completion, construction would begin during FY 1978 on a building for a new, larger staged full torus, 80 meters in diameter, 10 times the size of today's Scyllac, and employing forces in the 20-35 kilogauss range for heating and compression. When the building is completed in 1980-81, the present Scyllac would be phased out.

And proposed for funding in FY 1979 and scheduled for completion in 1984 will be the final facility for basic research: LASL's $160 million Scyllac Fusion Test Reactor. Within a building that would cover an area the size of a football field will be built another torus 80 meters in diameter. A field of 60 kilogauss would be used to compress a burning thermonuclear plasma.

Here is where all of the separate research programs comprising Controlled Thermonuclear Research as a whole will converge: staging, wall and feedback controls, plus some new ingredients:

—LASL's Magnetic Energy Transfer and Storage (METS) system would be phased in. Superconducting magnets (made superconducting by cooling to cryogenic temperatures) would store energy at more than 100 times the density of today's best capacitors for release during heating and compression.

—Tritium, another isotope of hydrogen, would be added to deuterium in the gas mix. Tritium is not used currently because, while it generates no radioactive waste, it is radioactive and requires special handling and some shielding. Tritium greatly enhances the fusion process and will be required in a power-generating reactor.

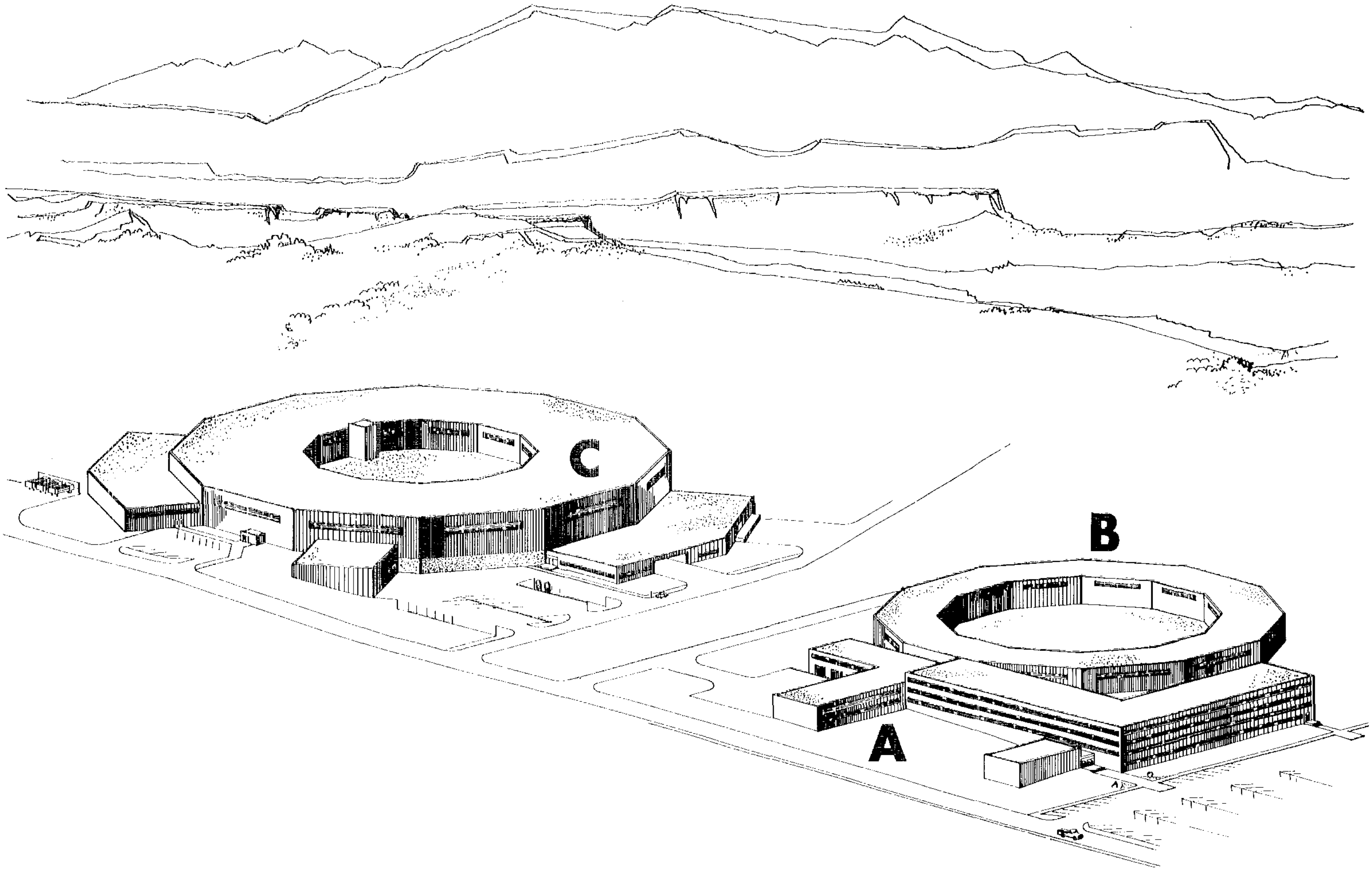
It is in the fusion test reactor that LASL researchers are confident they will reach the "turning-point" combination of temperature and containment time producing a break-even fusion reaction—where the plasma energy required to produce the reaction will be equalled by the energy generated by the reaction.

Such a turning point, obviously, will not signify practical fusion power production. But the light at the end of the tunnel would seem much closer, larger, and brighter. The emphasis from the turning point onward will shift towards technology and the engineering of power-producing systems.

Sometime in the late 1980's or 1990's, construction would start on a gigantic fusion power generating plant, the beginning of a dream come true: boundless energy derived from the sea—nearly pollution free, without problems of radioactive waste disposal associated with present-day fission reactors, and with inherent safety since, in the fusion process, a nuclear excursion, or runaway reaction, could never occur.

Future historians may well record that just as the path to fission power started at Los Alamos some 30 years ago, so did the path to fusion power. But the path to fusion power would have taken a very important turn—through Two-Mile Mesa.

Below is an artist's concept based on engineering drawings of the what the "CTR City" of the future on Two-Mile Mesa might look like. Development would be by stages beginning with a CTR office building (A) in 1978, to which would be attached a large staged Scyllac in 1980-81 (B). Final facility for basic research would be the huge Scyllac Fusion Test Reactor (C) in 1984.



Larry Hantel, WX-2, sights down the barrel of a 30-millimeter cannon prior to destructive testing of a weapons model containing a new high explosive. Mike Clancy, WX-2, positions model.

Firing Squad for a Reluctant Explosive

It has been a basic principle for the Los Alamos Scientific Laboratory to make nuclear weapons as safe as possible to transport, stockpile, and use in all environments. It is a tribute to the success of this endeavor that in the 30 years that the U.S.A. has been building and shipping nuclear weapons there has not been a single unauthorized nuclear explosion. An important part of the Laboratory's continuing weapons research and development has been directed toward incorporating all possible safeguards into nuclear weapons so as to make them inoperative should they fall into hostile hands, or to prevent a nuclear explosion should one be aboard an air, ground, or waterborne vehicle which becomes involved in an accident.

In recent years, however, world events have focused attention on an aspect of weapons safety which heretofore had not been a factor: armed guerilla attacks. In various nations, these have usually been directed at vulnerable nonmilitary targets. None, as of now, has been directed at the type of heavily guarded military installation where nuclear weapons might be stored. Yet, who can assure that extremists will never undertake such a mission, suicidal and unsuccessful as it might be? In the event of such an attack, bullets almost certainly would fly—and therein lies a potential risk for our times.

The projectiles could conceivably detonate the conventional high explosive (HE) associated with certain weapon designs. In imagining such a scenario, it is well to remember that LASL so designs nuclear weapons that a nuclear explosion could not occur even if the device were penetrated by bullets or other projectiles and the explosive detonated. But there is a potential problem associated with fissile material which might be scattered as a result of the HE detonation.

In the mid-60's, LASL began research into alternative types of HE which would be less likely to explode from the effects of heat, shock, or other extreme conditions.

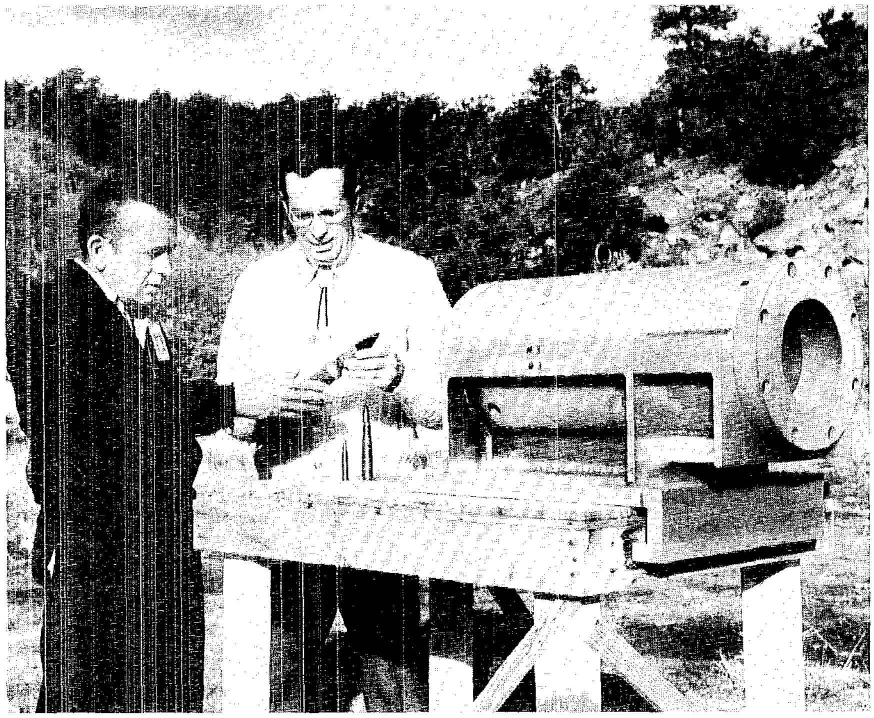
A number of materials were considered; surprisingly, the most promising was an organic compound that had been synthesized in the late 1800's, but at the time was not recognized as being an explosive. Called TATB (1,3,5-triamino-2,4,6-trinitrobenzene), it was not until the 1950's that its characteristics as a powerful, but insensitive, explosive were discovered.

The U.S. Navy became interested in the compound and devised improved methods of synthesizing the material. When it became apparent to LASL that an insensitive explosive could play a major role in increased weapons safety, Group WX-2 (a part of WX-Division, which is concerned with initial research in weapons engineering) developed practical methods of manufacture for TATB and its incorporation as a plastic-bonded explosive. This made it possible to produce the material in a form compatible with nuclear-weapon stockpile requirements. One of those deeply involved in this development was chemical engineer Ted Benziger, WX-2.

In all weapons research it is vital that theory be confirmed by actual experiments. Consequently, almost a year ago, WX-2 conducted the tests that were to prove the new HE's insensitivity to various types of high velocity military projectiles. Models simulating the characteristics of actual nuclear weapons were built—some with light, some with heavy casings—and loaded with X-0219, the name given to the new explosive by LASL. Two modified .50-calibre machine guns and a 30-millimeter cannon were moved to a firing site at Group M-3's Kappa Site.

No one could be quite sure that X-0219 would be so insensitive that it could withstand the devastating impact of several varieties of conventional, incendiary, and uranium projectiles. Everyone believed that the intense heat generated by an incendiary projectile would cause the explosive to burn. But would burning lead to an explosion? Only by testing could this be determined with certainty. Responsible for testing to observe these and a number of other effects were Larry Hantel, Mike Clancy, Chuck Hannaford, all WX-2, and John LaBerge and Bill Morton, both M-3, whose group provided the test facilities.

The guns and the cannon were loaded. Shields and instrumentation were positioned. Cameramen Billy Claybrook and Rob Gordon, ISD-7, set up high-speed "Hycam" movie cameras. The test crew retired to a bunker. By remote control, the first shot was fired. The test crew returned to observe and



Ted Benziger, WX-2, and Hantel inspect projectiles used for tests, which included 50-calibre conventional, armor-piercing, and incendiary bullets, and 30-millimeter uranium rounds. Below, Bill Morton and John LaBerge, both M-3, set up high-speed cameras behind blast shielding.

record effects. Throughout the ensuing months, the procedure was repeated.

Results? As Hantel later wrote:

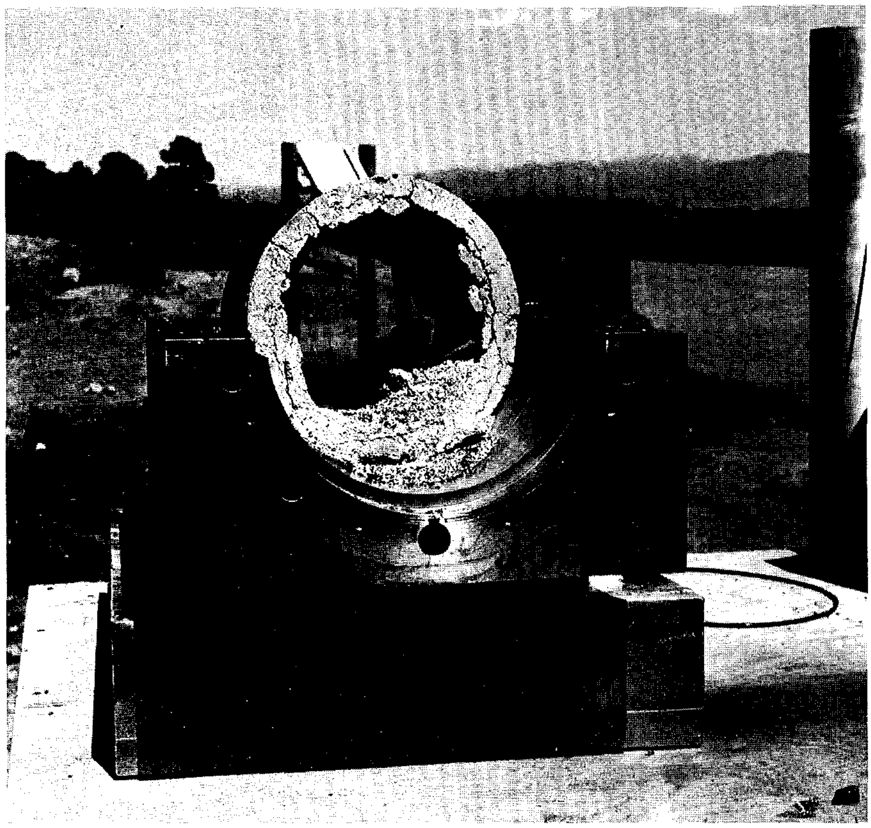
Shot 1—.50-cal M2 ball. The projectile struck the center of the model, completely penetrating it. About 10 grams of X-0219 were ejected from the entrance and exit holes. The Hycam photographs showed a cloud of fine explosive dust being ejected from the rear of the model and a "waterfall" of explosive draining from the entrance hole. No visible reaction occurred...

Shot 2—.50-cal tracer. We felt that the burning reaction in the tracer might start an explosive reaction in the X-0219. This round produced much more physical damage to the model than did the M2 ball, because of the projectile breakup. However . . . no evidence of a chemical reaction.

Shot 3—.50 cal API. We fired a .50-cal armor-piercing incendiary (API). . . again there was no evidence of a chemical reaction.

Shot 4—30-mm DU. We fired a 30-mm AP round with a depleted uranium (DU) core. . . extensive damage. . . The Hycam photographs showed a large fire as the uranium projectile penetrated the model. Most of the X-0219 was ejected in a fine cloud, which was subjected to burning pieces of uranium. However, no evidence of an explosive reaction could be seen.

Shot 5—Complete Model Test—.50-cal API. In contrast to the previous tests against the lightweight system, for this shot we modeled both sides of the weapon. . . This should greatly increase the chance of an explosive reaction, because we have doubled the amount of explosive and uranium in the target. The round completely penetrated the model, resulting in a small, nonviolent, burning reaction inside the model for about 5 minutes. The Hycam photographs showed fire, lasting only a few tens of microseconds, around the model immediately after impact. The only signs of reaction were a slight discoloration of the explosive around the bullet holes and a burned ring on the polyurethane tube where the second explosive layer was located.



Most of the new X-0219 explosive is blown from a heavily cased model by a 30-millimeter uranium projectile, yet only slight burning and no explosive reactions were observed.

These initial experiments were followed by tests using heavily cased models which, because of their greater confinement, were expected to increase the likelihood of an explosive reaction.

Shot 1—.50-cal AP. The Hycam photographs showed fire around the model for about 15 milliseconds after the bullet struck the steel layer. This was not a violent reaction... however, the X-0219 layer was badly damaged, and there was evidence of a burning reaction.

Shot 2—.50-cal tracer. This shot resulted in the most violent reaction that we observed from a .50-cal test. The Hycam photographs showed fire around the model for about 400 microseconds . . . enough pressure developed to blow confinement rings off both ends of the model holder. The burning reaction again seemed to include powdered HE burning in conjunction with uranium. . .

Shot 3—30-mm tungsten. As with the last shot against the lightweight system, here we have modeled both sides of the weapon. This time the model was knocked from the shot stand. All but the front layers of material were ejected from the model. The Hycam photographs showed a fiery reaction around the model. However, no violent reaction of the explosive was evident.

The remarkable characteristic of X-0219 to do nothing more than burn slightly, briefly, and nonviolently under the most severe type of physical attack can represent a timely addition to the already impressive design considerations devised to ensure the utmost safety in the handling and storing of nuclear weapons.

Q-Division's solar-energy seminar on February 26 played to a "packed house" in the Administration Building auditorium. On stage, left to right, are Jim Hedstrom, Stan Moore, Buck Rogers, and Doug Balcomb.

Solar Energy: Hottest Show in Town

On Wednesday, February 26, another standing-room-only program was held in the Los Alamos Scientific Laboratory's Administration Building auditorium. "Sellout" programs are not rare at LASL, but usually occur when renowned, out-of-town guests arrive to give colloquia with high entertainment value, such as Alistair Cooke's visit here on July 30, 1974.

Thus, it was a surprise to both the audience and those putting on the "show" that a seminar conducted by strictly local and decidedly non-show-business types drew such heavy attendance that fire marshals finally had to bar further admittance. The reason for the turnout was the topic, which may be the hottest in the energy field today: solar heating (no joke intended).

The topic was obviously relevant for many Laboratory employees planning to build or remodel in the face of today's escalating energy costs. Aided by Vu-Graphs, slides, and models of solar collectors, Doug Balcomb, Stan Moore, Jim Hedstrom, and Buck Rogers, all Q-DOT, shared a wealth of practical information accumulated in the course of their more advanced research on larger-scale Laboratory projects.

What clearly emerged from the meeting was that while solar energy utilization is not yet a matured technology with cheap, mass-produced components readily available off the shelf, that day is coming. No longer is solar energy the province of a few affluent and daring experimentalists, but is being accepted more and more by architects, builders, and pragmatic homeowners weighing tradeoffs between potential energy savings versus additional equipment costs.

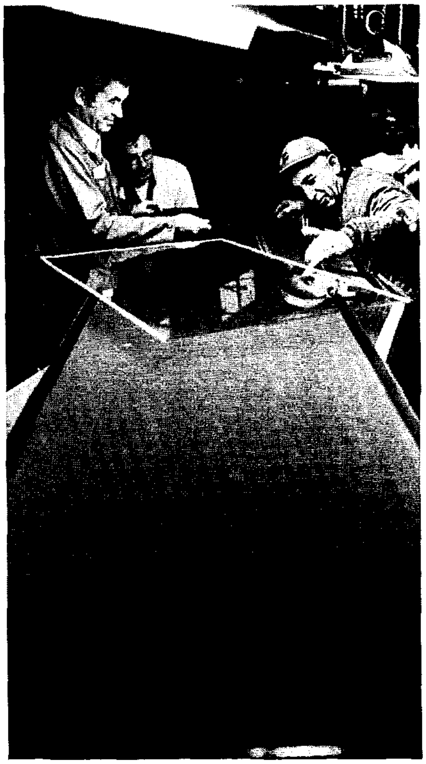
Generally, $4,000 or more should be allowed in preliminary planning for a reasonably sophisticated active system for a medium-sized home from 1,200 to 2,000 square feet. (An active system is one in which liquid or air is forced through solar collectors and directed to heat living spaces or storage devices.) In Northern New Mexico, such a system can save up to 80 per cent in energy used for heating (plus additional savings in hot water heating if solar heating is added to this system). Active systems are most feasible in new home design and construction.

An attractive alternative for many is a passive system, as explained by Rogers. Passive systems employ little or no mechanical equipment, relying instead on design, materials, and site orientation to trap solar heat. Many existing homes can utilize some of the principles of passive heating, which, with proper insulation can make a difference the owner can feel—physically and in his pocketbook. The use of some passive principles in new building design can also greatly reduce the net heating load required of an active system.

So popular was the first seminar that Q-Division scheduled an encore at 7:30 p.m. on March 12 to accommodate the many persons who could not be admitted to the first seminar.

The intense curiosity of the audience, as exhibited in the extended question-and-answer period, has encouraged Q-Division to begin preparation of a booklet summarizing the seminar. When printed, it will be made available to Laboratory employees.

And the same curiosity prompted *The Atom* to investigate Q-Division's solar energy activities further to bring you an update on the subject.



Determining glass requirements for one of Q-Divisions's experimental solar collectors are Larry Hupke, Q-23, Moore, and Fred Lujan, Q-23. Variations in iron content and thickness of glass, and in the use of single or double layers, affect efficiency.

Past Meets Future

Among New Mexico's pueblos, utilizing solar energy is nothing new.

It's no accident that many adobe dwellings were oriented for maximum southern exposure. Small rooms created a cellular effect, small doors and no windows retarded heat loss, and adobe was well known for its high heat storage capacity. The pueblo people could withstand harsh winters and bitter nights in adequate, if not toasty, comfort. A prime example is the multistoried apartments of Taos Pueblo.

Thus, when LASL scientists, armed with latest solar energy technology, and Governor Amadeo Trujillo and other leaders of the Nambe Pueblo were brought together in a cooperative effort supported by the Economic Development Administration of the U.S. Department of Commerce and the Energy Research and Development Administration, both found the arrangement *muy simpatico*.

The project is ideal from LASL's point of view. The pueblo is but 30 miles from Los Alamos. The project is a new community building now being designed by Santa Fe architect Allen McNown. The building, with 3,000 square feet, is large enough to accommodate the solar heating equipment and a reasonable amount of instrumentation, yet small enough to serve as a model for larger systems.

Common belief has held that liquid systems are more efficient than air systems, but Q-Division studies show that a properly engineered air system can be equal in performance. For more than one and a half years, Q-Division has been developing and testing liquid collectors. Recently, Q-Division has also developed an air collector consisting of a steel sheet, formed into rectangular channels, welded to one that is flat. Glass on top and insulation below the sheets complete the assembly, and the rigidity of the 2 x 10-foot unit makes it possible to integrate it into the roof structure.

The system will consist of approximately 1,000 square feet of these collectors installed at 50° on the south-facing portion of the roof, ducts, gates, a blower, 30 tons of rock under the floor for heat storage, and a logic unit to control blowers and gates according to temperature differentials. A portion of the hot-air energy will be extracted by a heat exchanger for heating water.

By participating in the design and observing the construction, LASL intends to maintain a high level of congruency between computer modelling, the systems analysis scheme, and the actual building. The objective of this effort—the first solar energy project supported by ERDA—is to develop simple design procedures suitable for general use and to compare air-cooled collector/rock bed storage systems with other methods.

And, of course, to provide the citizens of Nambe Pueblo with cheap, abundant heat in their new community center.

Further to the north and the west, the U.S. Department of Health, Education, and Welfare is building a 200-bed hospital for the Navajos in Shiprock. LASL has been granted ERDA funds to install instrumentation and evaluate a solar heating system to be installed there.

Mobile Solar Homes

Mobile homes constitute one-third of the new single-family units now being constructed, and the market is expected to grow. Roughly one-half use electricity or propane for heating, energy sources with which solar energy can compete effectively. Further, mobile homes are factory built. Taking advantage of mass purchasing and efficient labor should result in substantial reductions of an integrated solar system's cost.

In light of these considerations, Q-Division has begun designing and soon will build and test a series of 4 prototype units for mobile homes, especially for the double-wide type of units. These will probably be air-cooled collector systems built as an integral part of the mobile home roof. The first 2 prototypes will be for heating only, the second 2 will combine heating and cooling capabilities.

LASL intends to cooperate with one or more mobile-home manufacturers in the project.

Solar Cooling

A paradox to many is how heat can produce cold. The trick is to capitalize on the vaporization temperatures of various liquids and the principle of vapor condensation in closed systems producing very low pressures with a corresponding reduction in vaporization temperatures.

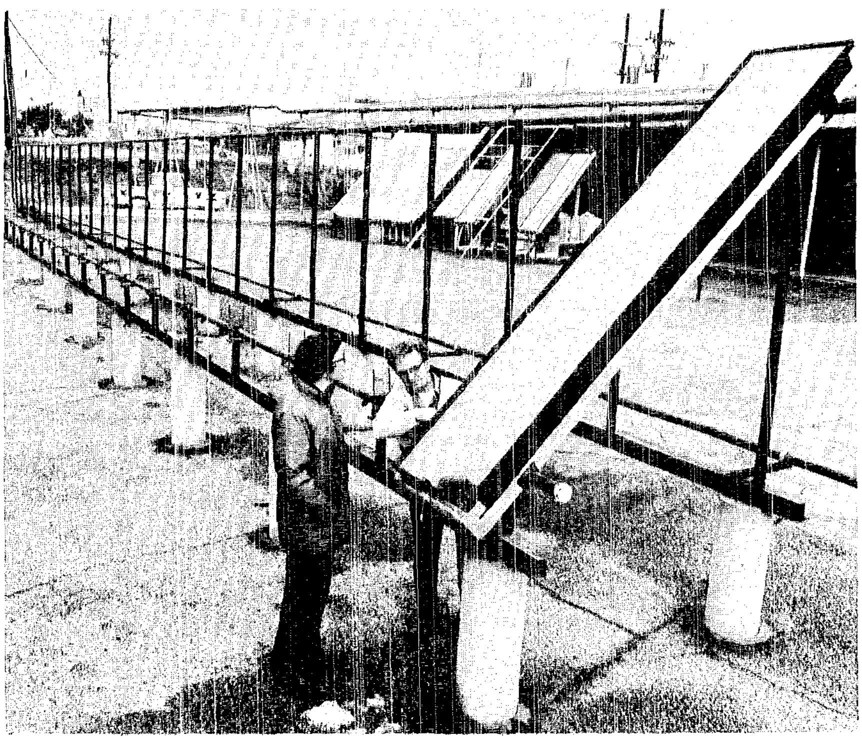
One such system is the lithium-bromide absorption chiller. A lithium-bromide and water solution is circulated through a heat exchanger where temperatures of approximately 200°F drive the water as vapor from the solution. This water vapor is then allowed to condense. In so doing, a partial vacuum is created, lowering the water vaporization temperature to about 35°F. This water is then circulated through a heat exchanger where heat is withdrawn from the building by the water's vaporization. In the last step of the cycle, the water vapor is reabsorbed by the lithium-bromide solution.

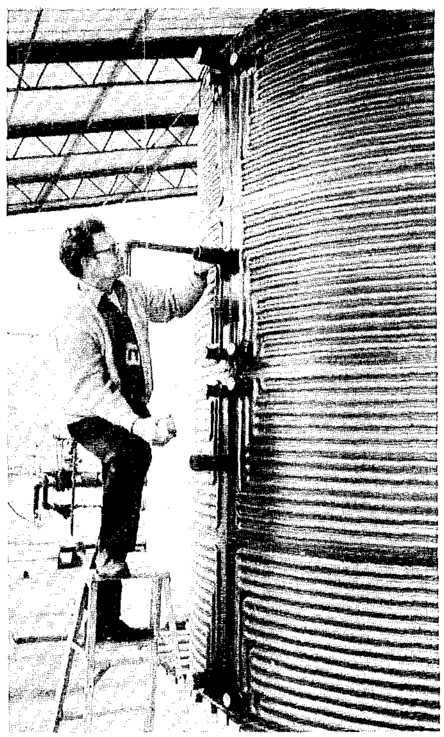
This type of cooling system, while efficient, has some drawbacks connected with the lithium-bromide solution and its tendency to precipitate salts. Consequently, another approach, the Rankine cycle cooling system, is being evaluated. Here, an organic coolant with a low vaporization temperature is circulated through a heat exchanger. Vapor under pressure is generated, which drives a turbine linked to a compressor, which in turn drives a system according to the familiar principles seen in home air-conditioning units. Despite some energy losses due to mechanical conversion, the system seems straightforward and relatively maintenance-free.

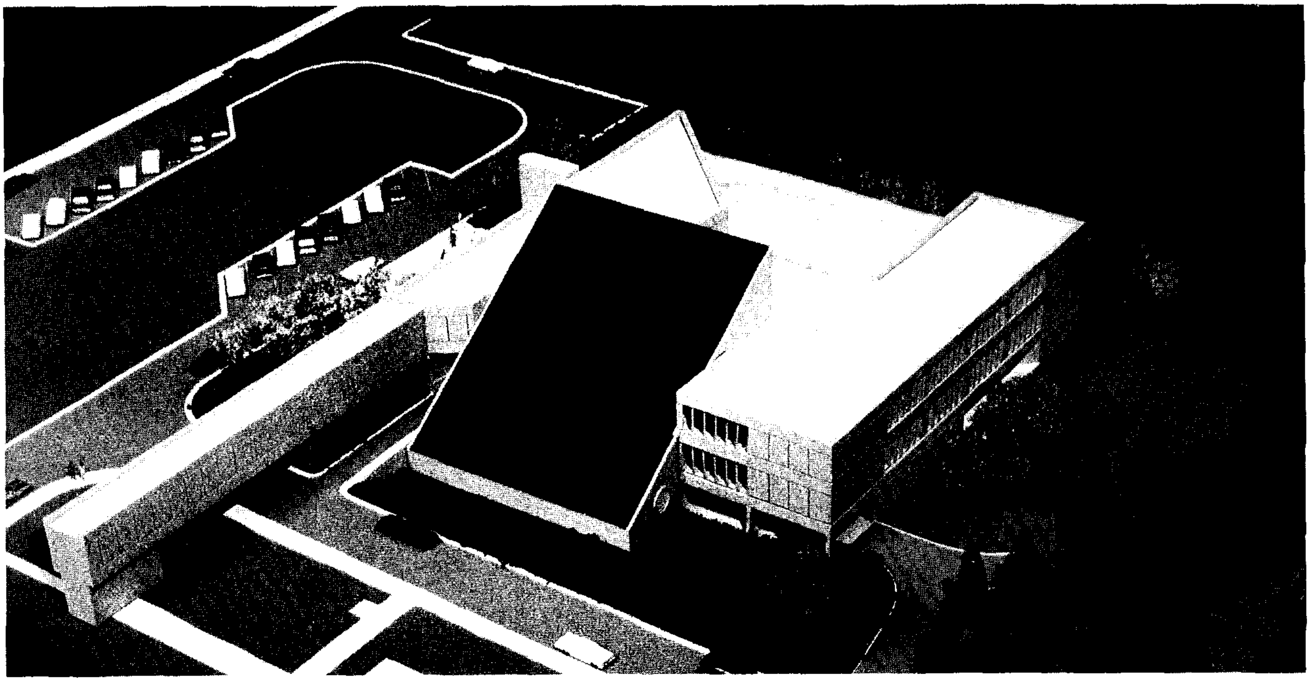
Q-Division is evaluating both systems, and one of each type will be incorporated into the solar energy system for side-by-side comparison in the new National Security and Resources Study Center which will be built in proximity to the Administration Building.

The pleasant summer climate of northern New Mexico sometimes obscures the fact that development of solar cooling is as important as that of solar heating in the national energy picture. In many areas, energy demands for summer cooling equal or surpass demands for winter heating. Most air conditioning is by electricity, and demand is heaviest at peak periods during the day.

Balcomb and Moore examine the first of 40 solar collectors being installed in an array at the TA-46 Test Station to test interface and flow characteristics. At right, Moore examines a LASL-developed storage tank with a heat exchanger built into its walls.







An array of 400 solar collectors is indicated by black panels at 45° in this scale model of the National Security and Resources Study Center. A covered overpass to the Center (left) is proposed for providing convenient access from the north end of the East Wing of the Administration Building.

Consequently, utilities must maintain expensive standby generators for air-conditioning requirements, and this equipment usually requires petroleum fuel. But at times, standby equipment is not enough. When heat waves strike and demand soars, the result may be dreary brownouts or even massive power failures affecting whole regions.

A National Solar Center?

Much of Q-Division's solar research is directed toward or related to its most important program: development of an optimized solar energy system for the approximately $4.5 million National Security and Resources Study Center, construction of which will begin this spring and be completed in 1976.

The spinoff from this development work is already impressive: a promising quilted steel-plate liquid collector lending itself to economical mass production; the possible use of the LASL-developed heat pipe, which moves heated fluid by capillary attraction and requires no energy; and an innovative liquid storage tank that has a heat exchanger built into its wall, thus eliminating the equipment and installation needed for a separate heat exchanger.

Presently, an array of 40 LASL solar collectors is being assembled at the TA-46 Test Station. Extensive testing has been completed on individual collectors; now the array will allow testing of the interfaces between collectors, including observations of the structural integrity of the assembled units designed to form a weatherproof roof, and the characteristics of parallel flow through the units.

These tests will pave the way for installation of 400 collectors covering 8,000 square feet in an array 100 feet tall and 80 feet wide facing south on the Center.

The Center itself is designed to enhance the efficiency of the solar-energy system through such means as insulation, optimized air circulation, and an air exhaust system that conserves much of the heat generated by light bulbs by directing the stale air through a heat exchanger before ejecting the air from the building. Through such engineering, the integrated building-solar energy "package" may well exceed its hoped-for 80 per cent savings in energy, Balcomb believes.

Within the Center and under the collector-roof there will be a gallery from which visitors may view the solar-energy system in operation. Instruments will show how the system is functioning at that time, displays will explain the system, and pipes and components will be color-coded for identification.

But the greatest benefits of the solar-energy system will entend far beyond heating and cooling the building, or showing visitors how a solar-energy system works. Systems analysis will be ongoing, employing computerized data acquisition and modelling on E-Division's hybrid computer. A wealth of information on climate, controls, and costs will be acquired. From time to time, the control system may be modified to test new concepts.

Thus, the National Security and Resources Study Center, intended as a national source of information on all the sciences, may also become a living, changing center supporting further development of solar-energy utilization throughout the country.

Which mouse—the white one with hair on the left, or the hairless one on the right—displays genetic effects of radiation? The answer is neither. The hairless mouse is the product of spontaneous mutation from a strain which was not irradiated. The normal mouse is the product of a strain of which the males were subjected to 200 rad of whole-body radiation, about ⅓ the lethal dose for mice and 5,000 times their natural background. In an 18-year program conducted principally by Jake Spalding, H-4, 75 generations of mice have been bred, equivalent to a family tree for humans beginning in 275 B.C. The lack of mutations in the exposed strain suggests that genetic effects of radiation exposure would not eradicate species as some believe.

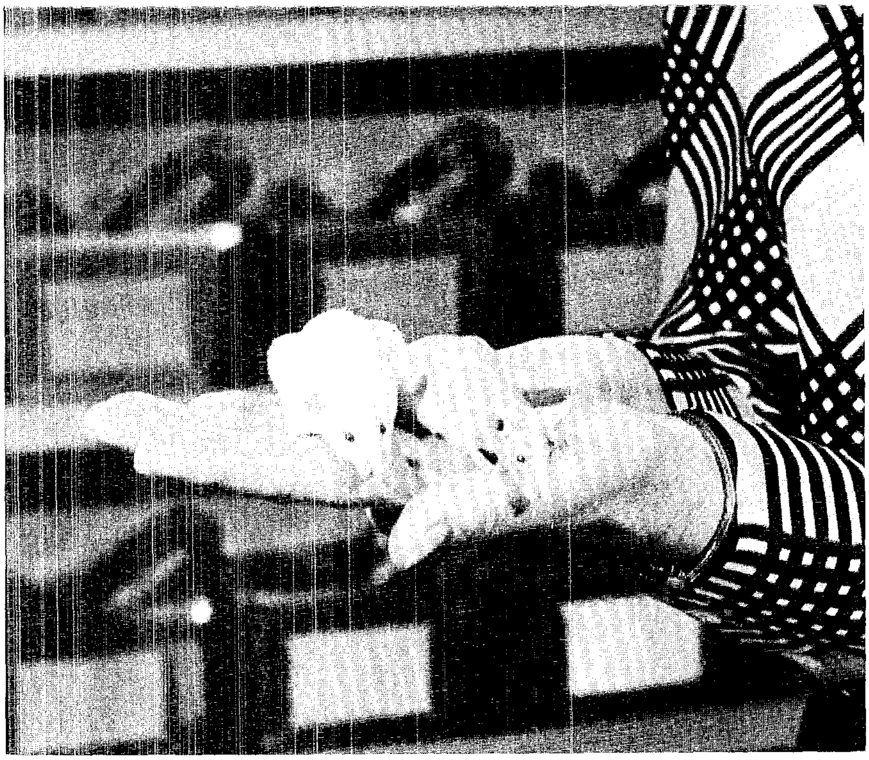
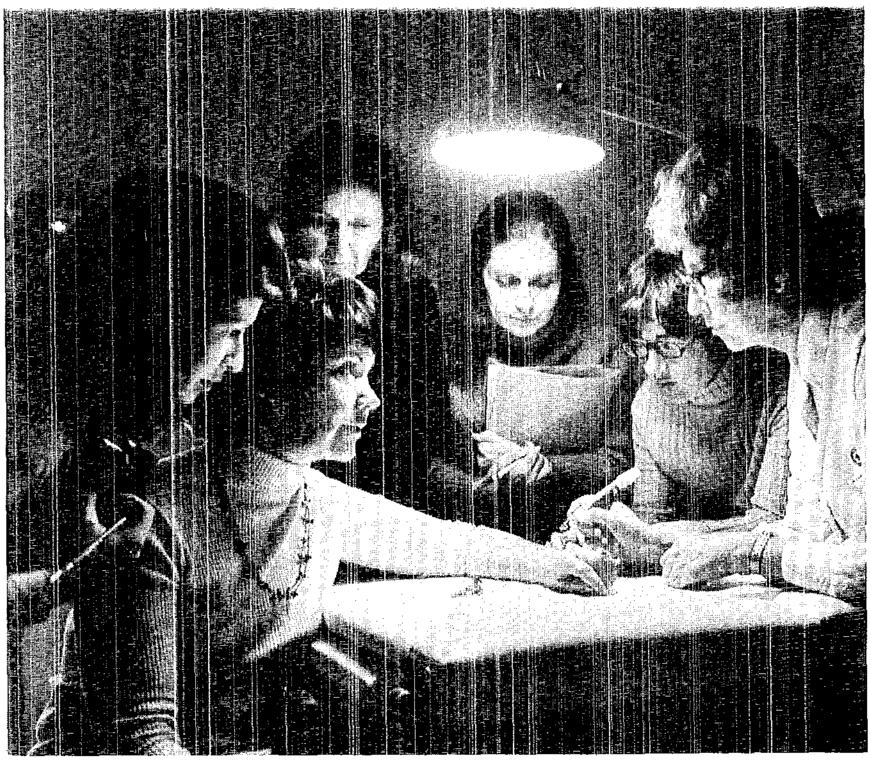


Photo Shorts



A superb instrument for detecting subtle color differences is the human eye, especially if the human is an artist. Thus, 6 Los Alamos area artists were recruited to assess differences between cancer nodules exposed to x-ray radiation and pion radiation at the Clinton P. Anderson Los Alamos Meson Physics Facility. Tests were conducted jointly by LASL and the University of New Mexico Cancer Research and Treatment Center. Morton Kligerman, LASL assistant director for radiation therapy, reports that data from the artists, shown above during training, "is the most consistent we have, to date." Left to right: Kathryn Golembiewski; Julia Blatz, Joan McConnell, Frances Enger, and Gayle Smith.

short subjects

Some 27 LASL employees were participants in a search for a missing aircraft in the Eagle Nest-Cimarron area of northern New Mexico February 10-12 which resulted in the rescue of 2 women passengers from a wrecked airplane. **John Brolley,** P-DOR, and **Charles Fairchild,** H-5, were Civil Air Patrol members who spotted the wreckage in a CAP air search coordinated by **Bill Overton,** Q-26. **Al Evans,** A-1, was overall search coordinator. Other LASL employees participated in radio communications and ground operations. Following the event, the Los Alamos County Commission commended the Search and Rescue Group of the Los Alamos Civil Defense Organization for service to the community and the state since 1964.

Harold Agnew, Director, has been elected Fellow of the American Association for the Advancement of Science (AAAS). Election occurred at a recent meeting of the AAAS Council in New York City.

From ERDA: **Robert Scott** has been appointed assistant manager for administration at the U.S. Energy Research and Development Administration's Albuquerque Operations Office. He succeeds **L. W. Otoski,** who recently retired. Scott was manager of the ALO Sandia Area Office at Kirtland Air Force Base-East and held several executive posts in Idaho and Colorado for the Atomic Energy Commission prior to his present position.

The Los Alamos Scientific Laboratory will host several hundred high school science students from a 5-state area on April 16, 17, and 18. Lectures will be presented in the Administration Building auditorium each morning and the groups will tour a number of sites each day as part of the annual observance of Science Youth Days sponsored by the Edison Day Foundation.

Frank Di Luzio, most recently science advisor and administrative assistant to former New Mexico Governor Bruce King, has been named assistant to the Director for planning at LASL. He had also been a special assistant to then-U.S. Senator Clinton P. Anderson of New Mexico, advising on space, atomic energy, natural resources, and science-related problems.

Di Luzio was area manager of the U.S. Atomic Energy Commission's Los Alamos office from 1952 to 1956 and deputy manager of the AEC's Albuquerque Operations Office from 1956 to 1961. From 1963 to 1965, he was executive director of the U.S. Senate Aeronautical and Space Science Committee and has held executive posts with the U.S. Department of the Interior.

Other posts include that of vice president of EG&G and president of Reynolds Electrical and Engineering, Las Vegas, Nevada. Di Luzio has served as a consultant to the National Aeronautics and Space Administration, the U.S. Department of Interior, and several U.S. Senate committees. He is also a member of NASA's Aerospace Safety Advisor Panel and of the Federal Energy Agency committee on Consumer Affairs and Special Impacts.

A professional engineer, Di Luzio attended Case Institute of Technology and is a graduate of Fenn College, both in Cleveland, Ohio, and the Harvard Graduate School of Business Administration.

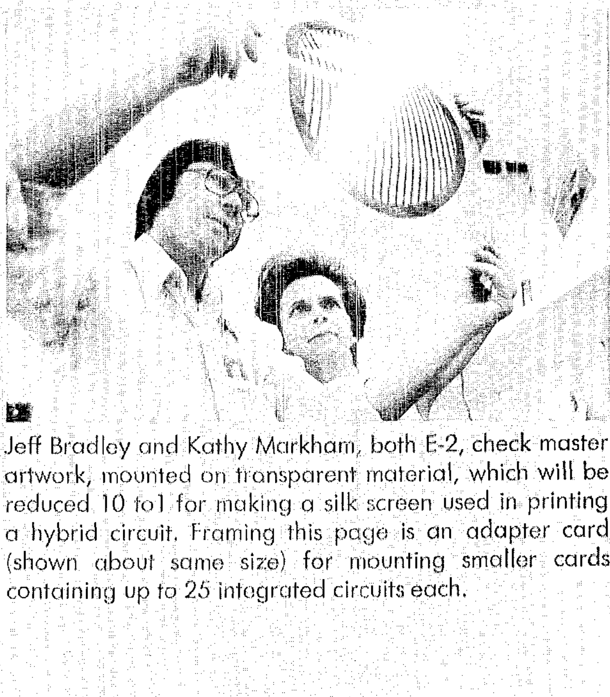
Retirements: **Barbara L. Price,** SP-3, clerk; **Neil D. Gardner,** CTR-1, mechanical technician; **Wylma F. Gardner,** CMB-1, clerk; **Wilmetta E. Brown, M-3,** property clerk.

Deaths: **Eligio Arquero,** MP-8, mechanical technician; **Daniel W. B. Jones,** retired, former WX-3 staff member; **Leslie Curfman,** retired, former AO-5 alternate group leader; **Kenneth C. Kohr,** J-12 staff member.

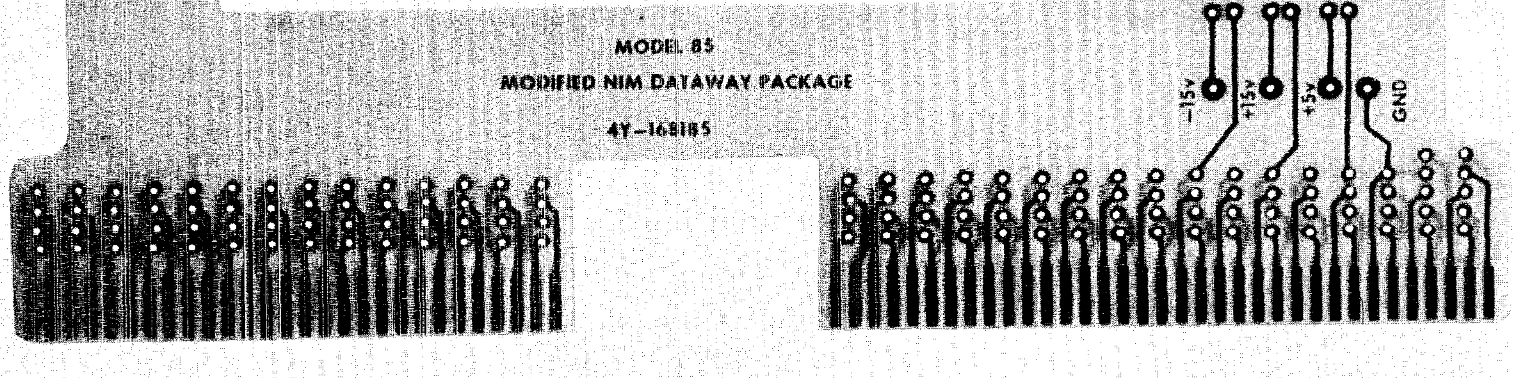
LASL's VERSATILE ELECTRONICS PLANT

Take an electronics company with almost 100 employees, a million dollars in plant and equipment, and a capability for fabricating products from almost microscopic hybrid and printed circuits to hefty 7.5-kiloampere controllers, and it would be the pride of a community, say the size of Santa Fe. Local newspapers would boast of that company's technological wizardry, and it would become well known both in the trade and in the state.

Put that same company in a scientific laboratory, however, and its identity would disappear as it becomes one of a number of support groups integrated into a much larger organization. The



Jeff Bradley and Kathy Markham, both E-2, check master artwork, mounted on transparent material, which will be reduced 10 to 1 for making a silk screen used in printing a hybrid circuit. Framing this page is an adapter card (shown about same size) for mounting smaller cards containing up to 25 integrated circuits each.



world beyond the laboratory would have no reason to know that such a "company" even existed.

That, in essence, is the status of group E-2 (electronic technicians) insofar as its "image" is concerned.

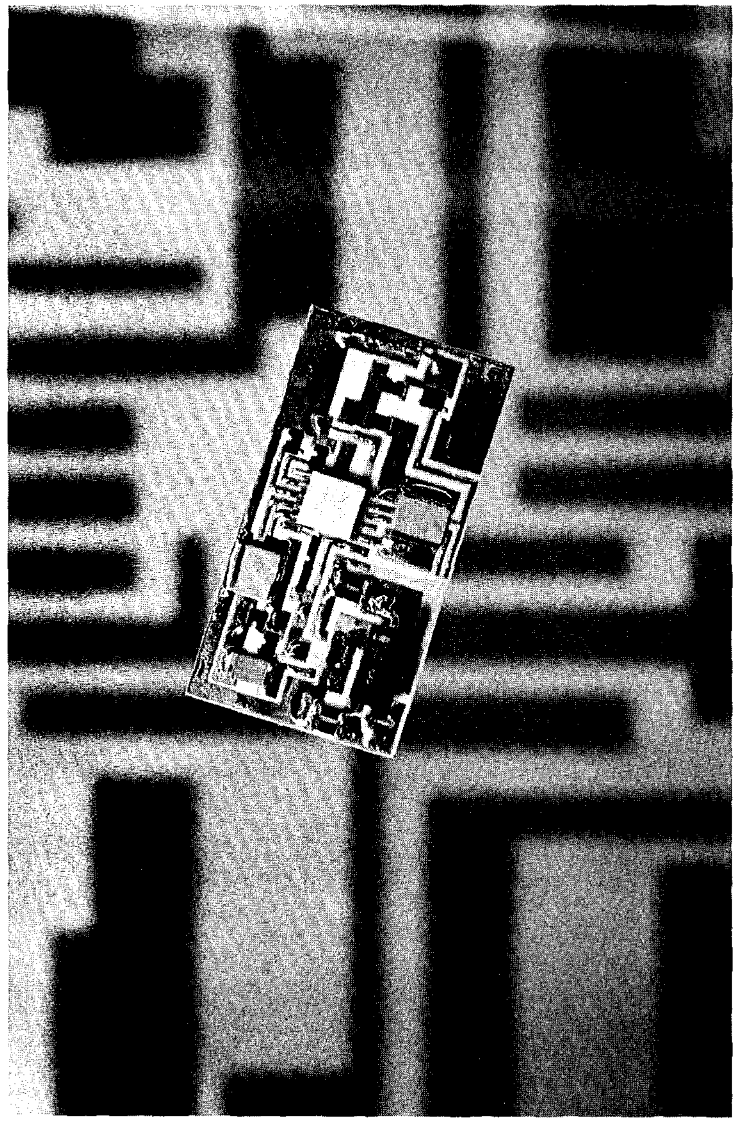
Recently, the group enlarged and refurbished its offices and workrooms in the Physics Building. Facilities range from small rooms equipped with delicate equipment used to fabricate circuit boards the size of postage stamps to a sizable machine shop with a 25-ton press brake for forming chassis and cabinets for bulky equipment.

More impressive than the like-new facilities, however, was what was going on in the rooms as technicians made finished products in a fully self-contained operation beginning with initial drafting and ending with tests and inspections for quality control.

Group E-2's most unusual feature is not evident in the rooms, though. This is a manpower pool of some 50 technicians divided about evenly between those who are assigned to projects within E-Division and those assigned to groups in other divisions. These technicians may "live" with their projects for months or even years.

Group E-2 has enlarged its facilities to keep pace with its growing "business" about the Laboratory, but occasionally suffers because of its non-image. "There have been a few instances where groups have had components fabricated by outside vendors when, if they had checked with us, they might have found that we could have done the job faster, cheaper, and better," Gordon Spingler, recently appointed E-2 group leader, says.

Perhaps these photos of the group's diverse activities can help correct that situation as well as giving readers an overview of what a modern and complete electronic fabricating operation is like.

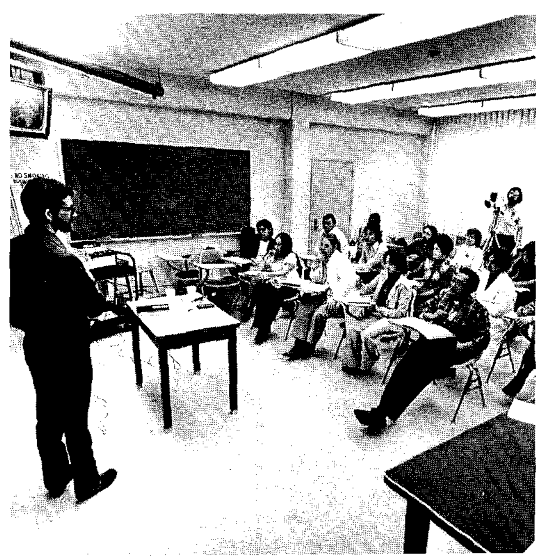


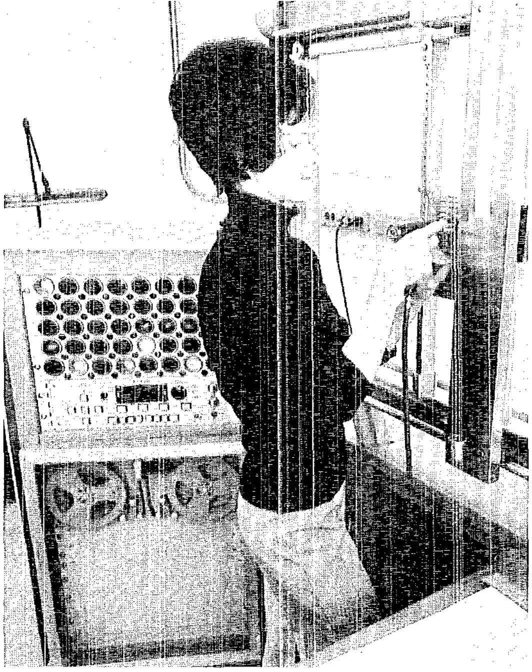
A hybrid circuit amplifier, about 1½ by 1 inch, for a voltage output radiation probe fabricated for Group E-5, is shown against a background of its original artwork.

Gordon Spingler, group leader, Ron Wagner and Brad Martin, assistant group leaders, plan activities.

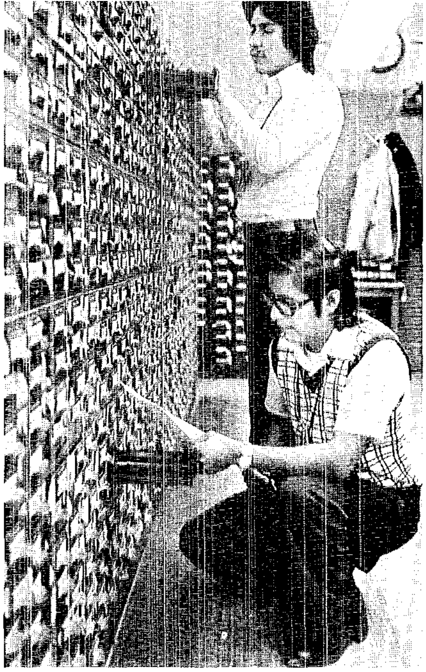
Jim Santana and Joe Bradley, both E-2, check a printout run for a Group MP-1 project.

Martin conducts a class for employees. Closed circuit TV tapes proceedings for future instruction.

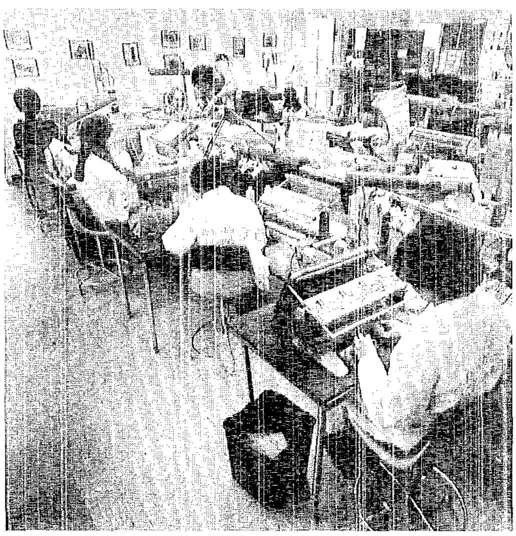




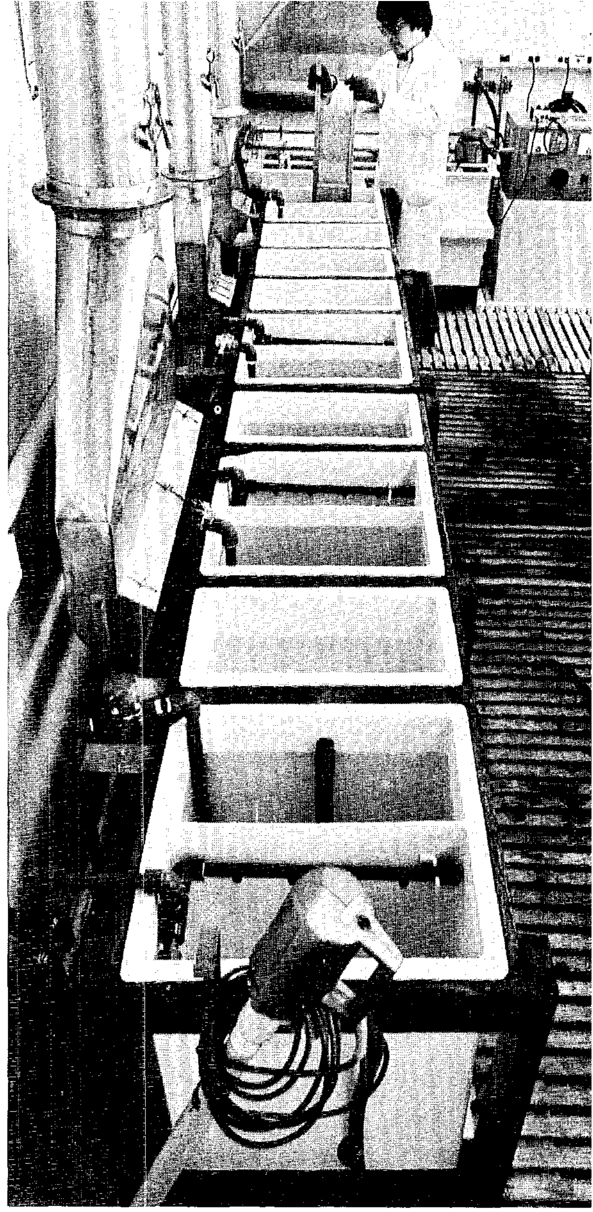
Erma Gibson, E-2, wires cards with the aid of a computer that positions a guide over terminals, and signals correct wire to withdraw from circular storage bins.



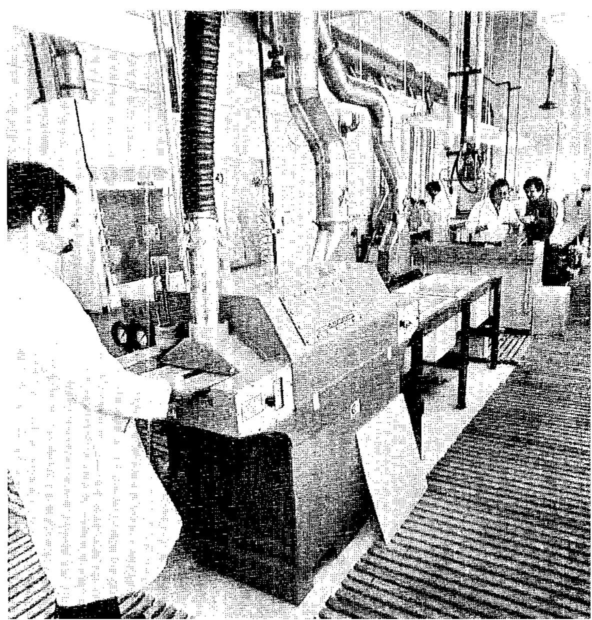
Joe Blea and Gerald Martinez, both E-2, withdraw components from the inventory. Some of the 4,000 parts are so small they must be handled with tweezers.

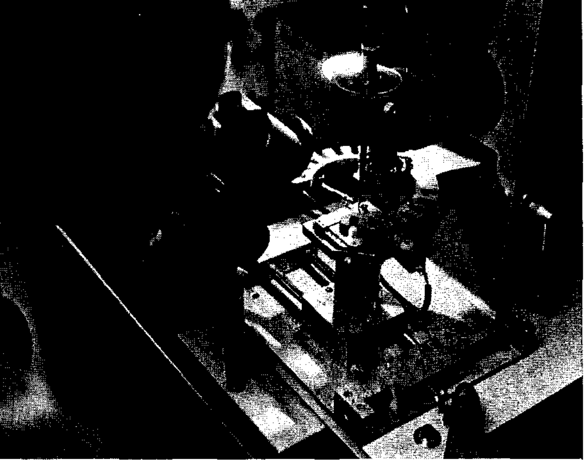


Not a model train layout, but a wiring board, here used by Phil Scoppetuolo, E-2, to harness cables for a controller in the background. Below is Group E-2's main electronics assembly area.



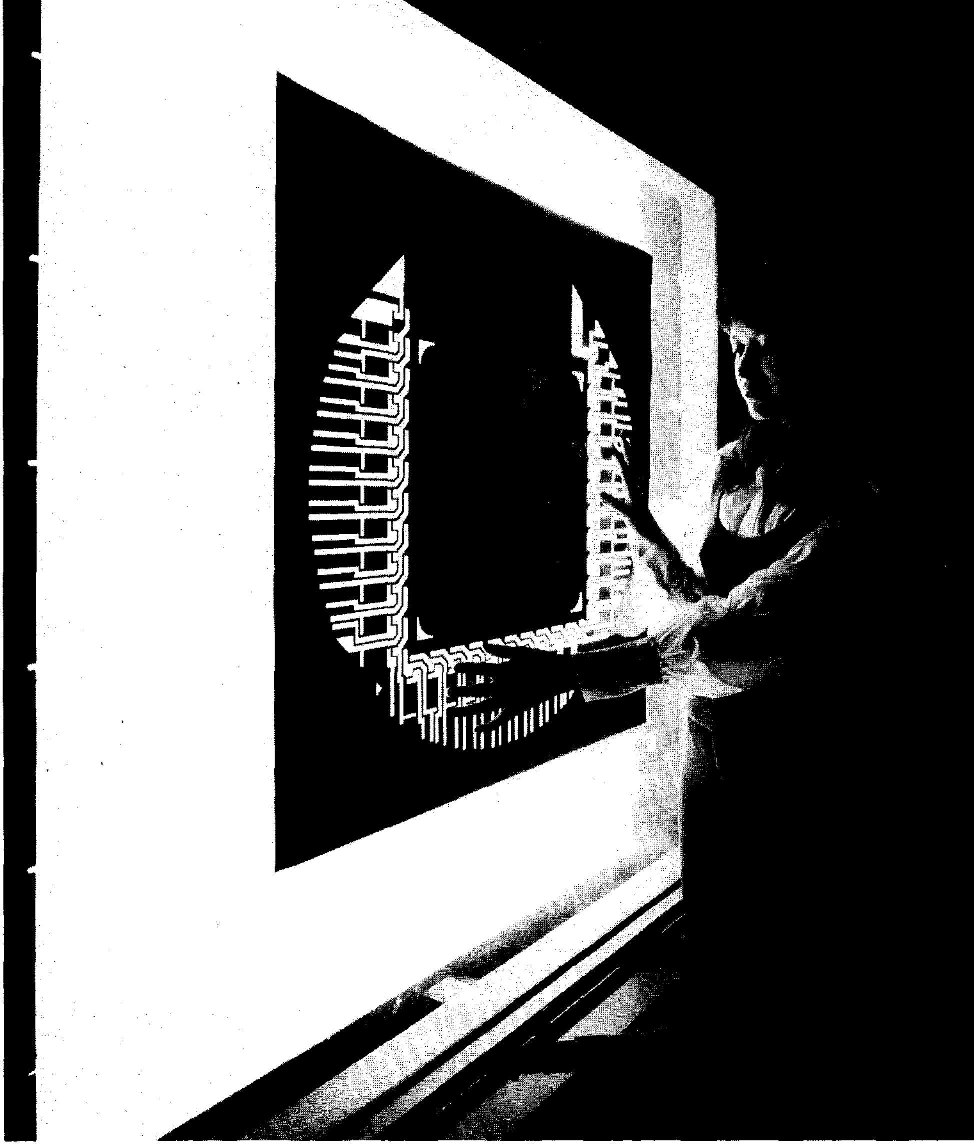
Mike Martinez, E-2, cleans printed circuit racks before beginning gold electroplating process in this series of tanks. Eufemio Romero, E-2, operates etcher (below) to complete the process.





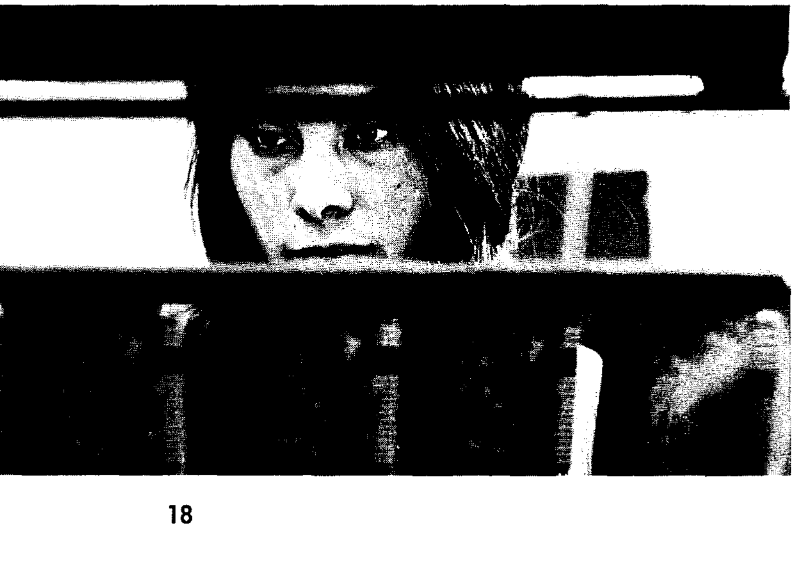
A tiny nitrogen jet directs a stream of powdered aluminum oxide into a hybrid circuit board to cut away portions of resistive material to increase resistance.

Eufemio Romero performs precision drilling of holes to connect circuits on both sides of printed boards.



Virginia Medina, E-2, demonstrates how artwork for a hybrid circuit is mounted on a backlighted copy board for extreme reduction by a camera that would be the envy of any printing shop.

Group E-2 personnel work with the very small and very large. Amelia Roybal, left, assembles printed circuit boards in the electronics assembly area while Eugene Stivers, right, operates a 25-ton press brake to form cabinets and chassis in an extensive machine shop.



10, 15, 20, 25, 30 Years ago in Los Alamos

On January 21 and 22, 474 Los Alamos Scientific Laboratory personnel received pins for service ranging from 10 to 30 years. Rather than merely listing the recipients, *The Atom* decided to add something extra: highlights, some serious, some lighthearted, of the years when most of these employees joined the Laboratory. (The majority joined the Laboratory during the years shown; a minority joined earlier, but had service interrupted by changes of employment or leaves.)

Hopefully, these highlights will recall a few vivid memories to the service-pin recipients. And for other readers, the synopses provide an overview of the history of the Laboratory practically from the day it was founded.

Bob Porton, ISD-2, author of *The Atom*'s popular "10 Years Ago" column, gladly consented to take a break for this issue while *The Atom* adapted his format for this combined account of service-pin awards and Laboratory history.

1944

This was the year that epitomized life on The Hill during the War. Uniforms were everywhere, from the one worn by the dentist who filled civilian teeth to the WAC who served sodas in the PX. One homesick GI from the Bronx hung a bagel over his cot; an inspecting officer curtly ordered him to eat it as the most effective means of removal.

Mud, cold, coal, and soot set the atmosphere. The town was bursting its barracks-type seams with a population of 5,700—considerably more than the 100 or so that the War Department believed would be needed to develop the atomic bomb. Curiously, not a single scientist was employed—officially. Scientist were called "engineers" and famous scientists used pseudonyms. Elaborate security measures were enforced (and resented), but did not prevent rumors from floating about Santa Fe as to mysterious doings on The Hill. Among the more far-out: the government was building a spaceship.

Enriched uranium and plutonium from Oak Ridge began arriving in meaningful amounts to make experiments possible, the Water Boiler reactor went critical, and prospects for the implosion-type plutonium bomb, on the verge of being scrapped as unworkable, brightened, leading ultimately to the construction of "Fat Man."

Scientists and their families struggled heroically to maintain some semblance of civilian amenities and social life. Bernice Brode, unofficial historian of the times, has written of one riotous square dance that ended abruptly with the collapse of a stove pipe, and a hit production of "Arsenic and Old Lace" featuring "corpses" such as J. Robert Oppenheimer, "Deke" Parsons, Bob Bacher, Cyril Smith, and Harold Agnew. (This was a follow-up to another "showbiz" triumph by Agnew—he had earlier won a prize at a costume party dressed as Jezebel.)

Other highlights: Mary Argo performed a memorable cakewalk; a young physicist, Robert Duffield, married Oppenheimer's secretary, Priscilla Green; and the June graduating class of a school of sorts consisted of 2 girls.

This was the year that was neither the beginning nor the climax of a brief era that forever altered the world, but a year that saw immense scientific progress and a population that boomed as scientists and technicians, called in secrecy, arrived in droves. Among them were many of those listed below who were recently awarded their 30-year service pins:

Balagna, John P., Jr., CNC-11
Brown, Leon J., J-12
Clancy, Marion L., WX-2
Dike, Robert S., CTR-4
Goldblatt, Maxwell, CNC-4
Hammel, Edward F., Jr., DIR-O
MacMillan, Donald P., WX-5
Montoya, Polly L., H-1
Moulton, George H., CMB-11
Nereson, Norris G., L-7
Prestwood, Rene J., CNC-11
Rosen, Louis, MP-DO
Salazar, Antonia M. R., WX-7
Spence, Roderick W., Q-DO
Struebing, Vernon O., CMB-5
Taub, James M., CMB-DO
Wortmann, Edward F., SP-12

1949

Cost of living increases were nothing new in 1949. Quite a few of LASL's 1,000 employees lived in dormitories in this era. A protest meeting was held when dormitory rental doubled; from $15 to $30 per month. To top it off, maid service was reduced.

On the other hand, some relief was experienced from a decline in grocery store prices: down 5.4 per cent in 7 months.

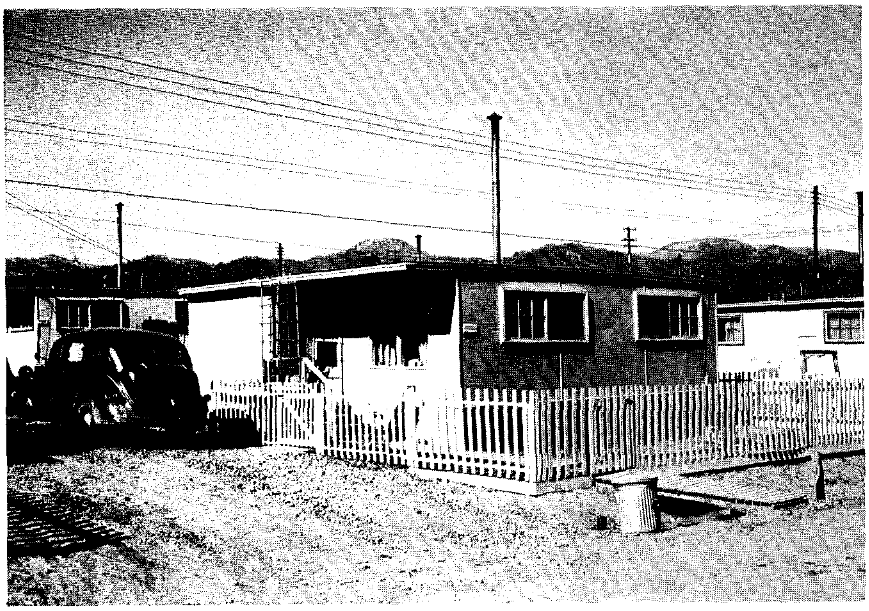
This was the year when Los Alamos became a county. It previously had been a part of Sandoval County, whose seat was Bernalillo. Other signs that Los Alamos was beginning to emerge from its army-base, boomtown stage and becoming a "civilian" community included the transfer of the Los Alamos Medical Center from the Zia Company to a nonprofit corporation, the completion of the present high school to replace an antiquated facility barely able to accommodate the less than 200 students enrolled, the formation of a Community Council, the organization of a Junior Science Museum, and the completion of the first permanent housing in North Community. The community's first rodeo was held at Los Alamos Ranch. KRSN, previously AEC-owned with its signal "piped" to Los Alamos residents via the community electrical system, was transferred to private ownership. Transmission was changed to conventional means, and the station acquired all the trimmings of normal programming, including network affiliation and commercials.

The Town Forum announced a schedule of distinguished speakers: AEC Chairman David Lilienthal, Stuart Chase, and Ogden Nash, to name a few. James B. Conant, former technical advisor to General Leslie Groves and then president of Harvard University, visited LASL. In Washington, Representative Chet Holifield (D-Calif.), warned the Joint Congressional Committee on Atomic Energy that Russia "can and probably will" wipe out America's lead in nuclear weaponry—a sign of the Cold War tensions prevailing at the time.

Through the town's guarded gates passed the first sizable group of outsiders—400 Kiwanians, plus their special guest, Miss America, for a convention. And through those gates during that year passed most of these 25-year service-pin recipients to become new hires of the famous facility on The Hill:

Anderson, John W., CMB-11
Aragon, Jesse, WX-3
Asprey, Larned, CNC
Balestrini, Silvio, CNC-11
Banta, James J., ENG-7
Barbo, Paul E., WX-6
Barnes, John W., CNC-11
Best, George H., ADWP-2
Biggers, Wendell A., J-12
Bourne, Joseph B., (Dec'd.)
Boyd, Thomas J., Jr., MP-8
Briscoe, William L., E-DOR
Brolley, John E., Jr., P-DOR
Buchen, John F., E-4
Bucy, George P., WX-3
Chavez, Ignacio S., WX-3
Ciddio, Walter R., SD-1
Criss, Filmore F., CMB-3
DePaula, Felix A., M-6
Diehl, Lena L., WX-3
Doremire, Fred E., M-2
Dorsey, Ralph E., J-12
Dougherty, John E., TD-7
Dube, Arthur J., C-1
Dumrose, Alfred C., CMB-8
Dvorak, James J., SP-3
Fitzgibbon, George C., CNC-2
Fletcher, Herbert B., WX-3
Ford, George P., CNC-11
Fox, William E., SD-3
Fullman, Earl W., J-16
Gage, Avery M., ENG-7
Gallegos, Bailon, SP-4
Gonzales, Alfredo J., WX-3
Greco, Anthony J., Jr., WX-3
Hackenberry, Lester S., J-8
Hanks, Gale S., CMB-6
Holley, Charles E., Jr., CNC-2
Hume, James T., E-2
Karr, Hugh J., CTR-2
Keevama, Preston, SP-3
Kemp, Edwin L., Jr., CTR-4
Knight, Jere D., CNC-11
Langley, Harold E., M-3
Leibee, Kenneth J., Jr., SP-12
Lopez, Praxedes, WX-3
Lovato, Filiberto, SP-12
Lucero, Arturo, WX-3
Lujan, Matias, WX-3
McCracken, Walter E., ENG-9
McQueen, Robert G., M-6
Maestas, Jose A., SP-4
Maez, Alonzo U., WX-3
Martinez, Bernie Q., AO-4
Martinez, Henry, WX-3
Martinez, Jose I., H-5
Martinez, Juan E., SP-3
Martinez, Maria T., WX-7
Martinez, Roberto E., WX-3

In 1949, residential areas of Los Alamos still retained much of their wartime, boom-town atmosphere.



Matlack, George M., CMB-1
Montoya, Antonio J., WX-3
Montoya, Willie, SP-4
Montoya, Willie N., SP-4
Mosher, Donald M., WX-3
Moxley, William C., SD-5
Naranjo, Manuel J., WX-2
NaVeaux, Harold W., SD-5
Newell, Evelyn M., ISD-3
Olivas, Juan, WX-3
Ortiz, Hernando V., SD-5
Osborne, Robert K., TD-4
Owen, Roy, ENG-14
Pena, Juanita V., CMB-1
Perrings, James D., H-10
Phillips, James A., ENERGY
Quintana, Secundino O., P-DO
Rabideau, Sherman W., CNC-3
Raper, Verdie L., WX-3
Redman, Leslie M., ISDO
Rico, Lillie, WX-7
Robinson, J. L., WX-3
Rogers, Benjamin T., M-2
Rohwer, Robert K., WX-2
Romero, Ruth C., SP-12
Roybal, Theodore G., ENG-1
Ruthven, William J., SP-3
Rynd, Edgar B., WX-1
Sanchez, Luis G., SD-1
Sanchez, Tomas G., H-11
Schofield, Aldred E., CTR-2
Schowalter, Kenneth J., SD-5
Smith, David R., P-5
Smith, Louis C., WX-2
Smith, Maynard E., CMB-1
Smith, Milo M., SD-5
Stein, William E., P-DOR
Stevens, Donald E., E-1
Stewart, Ernestine V., WX-7
Stewart, William H., WX-3
Storm, Ellery, H-1
Strein, Arthur N., WX-3
Szklarz, Eugene G., CMB-3
Tattan, Mark H., CMB-QA
Tinkle, Marvin C., CMB-8
Tyson, Robert D., SD-5
Valdez, Paul, SD-4
Vigil, Simon J., WX-3
Vigil, Victor, CMB-6
Warner, Robert F., MP-DO
Weber, Joseph L., A-3
Wentworth, Eva L. M., J-1
Will, Edward F., SP-3
Williams, D. Lloyd, H-9
Williams, Wendell R., WX-3
Zeigner, Vernon L., L-DOT
Zukas, Eugene G., CMB-8

NTS
Williams, Wiley S., SP-DO/NTS

1954

This was a year of "fireworks"—in the Pacific and at home. In an era of intensive weapons testing, the "Castle" series was conducted in the Pacific. The "Bravo" shot in this series created a worldwide alarm as, unexpectedly, heavy fallout fell on a Japanese fishing boat and on natives in the area. The unfortunate episode led to more elaborate—and effective—precautions for subsequent tests and this type of incident did not occur again throughout the period of atmospheric testing.

At home, a major forest fire led to alarm over the safety of S and GT Sites. Some say the fire was an example of good intentions gone awry. A group of Los Alamos citizens was burning scrap wood to eliminate it as a fire hazard. High winds whipped the flames out of control. The roaring fire jumped State Road 4 and raced toward technical sites. Men joined volunteer squads (2 showing up in shorts and sandals were sent away to find more suitable garb) and women worked around the clock at the S-Site cafeteria preparing hot food and coffee for weary firefighters.

The completion of the bridge over Los Alamos Canyon some 3 years earlier led to rapid construction of Laboratory facilities on South Mesa. In 1954, construction began on the present Administration Building. The Health Research Laboratory was completed at a cost of $2.4 million. Laboratory facilities grew to 300 buildings on 77 square miles accommodating 3,000 employees.

Los Alamos was still a closed community with vestiges of its wartime origins. Most citizens favored retaining security stations on access roads to keep disturbing elements out. (Nevertheless, security stations were removed 3 years later and Los Alamos "joined the outside world").

The Sundt apartments and singles dormitories, whose tenants often rented furniture from the Zia Company, were home for many. If life was less than luxurious in the dormitories, frequent and memorable parties provided some compensation.

The Laboratory was proud to receive a citation from President Eisenhower for its "invaluable service to the nation and the free world" in an age when such awards were not dispersed in the volume of computer printouts, and was pleased to welcome as new hires most of the recipients of 20-year service pins shown below:

Agnew, Lewis E., Jr., MP-7
Armijo, Voncille M., CNC-11
Baker, Floyd B., WX-2
Barnes, John F., T-4
Beg, Henry C., SD-5
Berg, Clarence M., SP-10
Bonner, Austin D., M-6
Branch, Richard O., C-1
Brazier, Emmett L., Jr., ENG-DO
Brown, Willmetta E., M-3
Cata, Thomasita, C-1
Chavez, Lillian I., DIR-SEC
Clark, Charles Q., SD-5
Cochran, Donald R. F., MP-DO
Cole, Robert L., Q-26
Cordova, Bernardita A., WX-7
Damiano, Adeline E., P-3
Davis, William C., M-3
Dreicer, Harry, CTR-1
Dresback, Shirley N., CMB-QA
Elliott, Dana E., M-1
Elliott, Guy R. B., CNC-2
Elliott, Jimmy C., M-2
England, Laurene F., SP-3
Enloe, Carl A., ENG-4
Farmer, John R., WX-3
Frankoski, William J., J-7
Freidline, Eldon H., WX-3
Fuller, Charles W., M-2
Gardiner, Thomas, E-3
Gardiner, Verna L., C-4
Geelan, Thomas B., Q-26
Gerardot, Manfred J., WX-3
Godfrey, Thomas N. K., TD-DO
Grady, Elmer L., SD-5
Gray, Lonnie D., M-3
Greenwood, Ralph H., P-4
Gursky, Martin L., TD-2
Gutierrez, J. Wilfred, J-12
Hannemann, Ralph B., CTR-4
Harris, Paul O. J., SD-1
Henning, Robert L., ENG-2
Hewitt, Lloyd A., SD-4
Hudgins, H. Jeanne, C-3
Jackson, Jasper A., Jr., P-11
Keepin, G. Robert, A-1

Kellogg, Harvey J., SD-1
Kerr, Vernon N., H-11
Koonce, Andrew M., ADWP-O
Korte, Wilbur A., SD-5
Kruse, Herald W., J-14
Landahl, Charles E., L-1
Levin, Jules S., E-5
Lopez, Merced M., WX-3
Lundgren, John L., CMB-11
Manes, Maurice E., WX-1
Marsh, Stanley P., M-6
Martinez, David A., SD-1
Martinez, Edward, ISD-7
Martinez, Roman, H-4
Marx, Joseph E., SD-1
Mirabal, Ernestino, WX-3
Mitchell, Kenneth B., L-1
Montoya, Baudino J., M-5
Nordhaus, Emil, SD-5
Olson, Roy A., P-4
Ott, Donald G., H-11
Parker, Frederick R., T-1
Peacock, Marjorie J., P-12
Peaslee, Alfred T., Jr., TD-7
Pederson, Raymond A., H-1
Peterson, Robert W., J-16
Ranken, William A., Q-25
Reavis, James G., CMB-11
Reed, Clyde H., L-2
Rodgers, Nora C., TD-4
Rodriguez, Mollie G., L-DO
Rohr, Dana L., CMB-5
Salazar, R. Manuel Jr., SP-2
Schowalter, Ione M., TD-4
Schrandt, Robert G., TD-6
Schweitzer, William H., H-8
Smith, Morton C., Q-22
Sprouse, Leland B., J-16
Stein, Myron L., C-3
Sturgess, Lorene L., WX-5
Sullivan, Elizabeth M., H-DO
Taylor, R. Dean, Q-26
Van De Valde, Angie T., PER-1
Winslow, Orville G., M-3
Wolff, Walter P., J-8
Worlton, W. Jack, C-DO

1959

The year 1959 may have been a record for visiting royalty: King Baudouin of Belgium, the Aga Khan, Queen Frederika of Greece, and her daughter Princess Sophie. Other notable guests included Peggy Pond Church (daughter of Ashley Pond, original Ranch School owner) who returned to Los Alamos after 17 years, and German nuclear pioneer Fritz Strassman. Strassman made a prediction that seems prescient today: that the atom would become the main source of energy in 20 to 30 years (1979 to 1989) and that energy produced by coal would cost 3 times that produced by nuclear materials by 1990.

George Cowan, left, and Fritz Strassman, German nuclear pioneer (both here examining a nuclear emulsion at LASL) made news in 1959. Strassman uncannily predicted fission's future in the energy crisis and Cowan was associated with the ultimate in acronyms: INSANE.

The Cold War thawed momentarily to allow the first Soviet scientists to visit LASL. And 12 burros, for biomedical research, arrived by air. A waggish reporter for the then-new LASL Community News (predecessor of *The Atom*) noted that cooperating agencies (here nameless) were "well equipped with jackasses, but lacked necessary equipment supplied by LASL."

Six buildings, including a $4.4 million hot-cell addition to the CMR Building, were completed and construction on 10 or more was begun, plus an addition to the Health Research Laboratory to house 50,000 mice, 70 dogs, and 50 monkeys for biomedical research. Elsewhere in biomedical research, the Godiva critical assembly equipment was used to irradiate peanuts, producing disease- and wilt-resistant strains while researchers were baffled to find healthy bacteria thriving in the water of the Omega West reactor.

Somehow, George Cowan, now CNC-Division leader, found himself heading a steering committee for the ultimate in acronyms: INSANE ("Industrial and Scientific Applications of Nuclear Explosives") while somebody who would just as soon forget he said it, proclaimed, upon the placement of the order for an IBM super-computer named STRETCH, "we are coming down the stretch in computer design . . . there is not much farther to go. . ."

Scientists inside the since-razed "Manor" at TA-15 developed components for PHERMEX inside, went outside to use an honest-to-gosh "crescent moon" facility. Elsewhere in science, Kiwi-A, the first test reactor of the Rover nuclear rocket propulsion program, was tested at Jackass Flats, Nevada, and the LAPRE II liquid fuel reactor produced 1 megawatt of power at 800°F.

In the community, the transition from a U.S. "company town" to a private community gained momentum as a Congressional subcommittee held hearings on housing, the removal of perimeter security, the public use of the airstrip, and commercial leases. The George Whites received the first deed to private property in Los Alamos, the first 5 homes on Barranca Mesa were completed, and private development of present-day White Rock began.

And 1959 was the year when most of these 15-year veterans joined the Los Alamos Scientific Laboratory:

Amsden, Anthony A., T-3
Apodaca, Marie D., Q-23
Argo, Mary F., T-4
Asbridge, John R., P-4
Babich, Frank, H-1
Balcomb, John D., Q-DO
Barnes, Jo Ann, E-DO
Barrone, Cecilia M., ISD-5
Benton, Clarence U., J-16
Beyer, William A., T-7
Black, Harold E., Jr., SD-5
Brown, Donald W., Q-22
Brown, Edward A., E-4
Burkheimer, Bruce E., MP-10
Claiborne, Eddie R., MP-DO
Conley, Andred P., MP-1
Conn, James R., ADW-PM
Cordova, Lilly V., MP-10
Cornwell, Fred L., C-4
Crandall, Kenneth R., MP-9
Cuntz, Carl L., Jr., ISD-2
Daggett, Charles W., ENG-4
Dennis, Bert R., Q-22
Dick, Richard D., M-4
Dildine, Lois A., ISD-4
Eash, David T., CMB-8
Eberhardt, William T., ENG-2
Elder, Thomas N., WX-7
Engleman, Rolf, Jr., CMB-1
Erpenbeck, Jerome J., T-DOT
Fairchild, Charles I., H-5
Foley, Edward, L-1
Frame, Jean K., WX-5
Fraser, Malcolm V., C-9
French, Garrison H., MP-11
Fuller, Jack C., WX-6
Furnish, Alfred P., MP-2
Gibbs, Terry R., DIR-OFF
Gill, Robert J., SD-5
Gillespie, Bennie J., WX-1
Harbert, Thomas, M-4
Hart, Valgene E., MP-8
Hasty, Jeanne E., CNC-11
Hayden, James J., L-1
Hayes, Darryl F., SD-5
Helland, Jerome A., MP-3
Herrera, David H., SD-1
Hodson, Ernest K., J-14
Hopkins, John C., J-DO
Horney, John L., H-10
Jardine, David L., CTR-2
Johnson, Marjorie A., ISD-4
Johnson, Minnie R., WX-3
Johnson, Yvonne V., CTR-6
Jordan, Elwood P., CMB-7
Kelley, Teresa K., CNC-11
Kelly, Leo Michael, MP-8
Kennedy, Julia W., PER-7
Kershner, James D., T-4
Lawrence, Francine O., CNC-11
Leatherwood, Willis D., SD-5
Lopez, Joseph Eugene, WX-3
Lowery, Clydelle, WX-3
Lujan, Barbara J., ISD-5
Lytten, Jesse J., L-6
McKnight, Alvie L., C-2
Mace, Phillip N., L-7
Manger, Lucia G., M-2
Mattys, Beverly Ann, PER-1
May, William A., Jr., WX-3
Miley, Franklin, CMB-11
Mohr, Walter F., Jr., CMB-11
Morrow, Don R., SD-DO
Mudd, William L., TD-4
Mueller, Marvin M., L-4
Ogard, Allen E., CNC-11
Partridge, Ralph E., Jr., J-8
Peterson, Leah L., TD-2
Prestwood, Sara L., H-2
Pyburn, Carol A., ENG-10
Rayburn, Lois L., MP-DO
Regan, William H., ISD-1
Roberson, Neva J., PER-6
Rochester, Richard H., WX-7
Rodgers, Bill J., ISD-1
Romanik, Theodore, CMB-7
Roybal, Grace C., CTR-2
Schilling, Frederick P., ENG-6
Schuster, Esther, AO-4
Seegmiller, Emma T., WX-7
Segura, Bernie A., WX-3
Seitz, Thomas P., ADW-PM
Shannon, Patsy R., C-1
Showers, William H., DIR-SEC
Smith, Chester R., MP-8
Smith, Darryl B., A-1
Snyder, James W., SD-4
Stapleton, Robert E., L-1
Stapp, James W., WX-7
Stewart, John N., Jr., J-9
Stoms, William D., E-2
Strait, Bobby G., E-4
Streetman, John R., TD-3
Syska, Carolyn J., E-DO
Taylor, Rosalie G., T-DO
Taylor, William M., TD-6
Tisinger, Richard M., L-8
Torres, Daniel J., C-9
Treiman, Marilyn H., ISD-4
Trujillo, David, SD-1
Turner, Robert W., ENG-9
Upham, Donald L., WX-2
Valdez, Fidel, H-4
Van De Valde, Edmund L., CMB-6
Velarde, Edward, WX-3
Velasquez, George A., M-2
Waggoner, Glenn E., WX-3
Wahman, Lyle A., CMB-8
Walker, Arthur W., C-4
Watts, Rose M. A., P-4
Weeks, Neil W., H-7
Wenzel, Robert G., L-3
White, Jesse G., Jr., J-8
Wingert, Edward F., M-6
Wittman, Patricia K., PER-1
Wolfsberg, Kurt, CNC-11
Wood, Gladys H., WX-7
Workinger, Robert V., J-8
Worstell, Hairston G., MP-8
York, Don A., DIR-FMO

1964

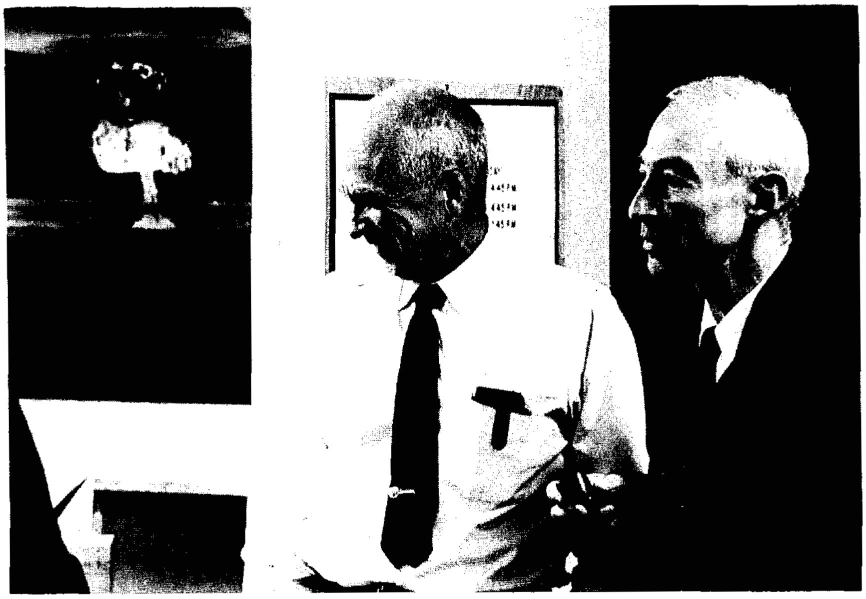
Close-down and tear-down contrasted with $13 million in construction (including a major addition to the Administration Building).

In what is now downtown Los Alamos, the Laboratory's original technical area, TA-1, was shut down when Jim Taub, CMB-DO, pulled a switch that turned off a hot press in the foundry as other LASL pioneers and AEC officials watched. Nearby, the famous (or infamous, depending on your point of view) Sundt apartments were removed. Both events "cleared the tracks" for expansion of the present-day downtown area.

"Little Van," the 26-year-old Van de Graaff accelerator brought here by Joe McKibben and other University of Wisconsin scientists for wartime research, was dismantled. It was superseded by the 4-times-more powerful Tandem Van de Graaff at TA-3.

Early in the year, LASL instruments aboard 2 Vela satellites discovered clouds of high-speed electrons 60,000 miles out from the dark side of the earth. Later in the year, 2 more LASL-equipped Velas were lofted. Two Kiwi reactors were made to function in close proximity without neutron interactions between the units adversely affecting performance, thus demonstrating the feasibility of clustering Kiwis, and the last of 8 Kiwis performed brilliantly in Nevada.

J. Robert Oppenheimer made his first public appearance in Los Alamos since his resignation as Director in 1945, and Harold Agnew re-



Then-Laboratory Director Norris Bradbury and former Director J. Robert Oppenheimer during Oppenheimer's first visit to LASL since his resignation in 1945.

turned after 3 years of service as scientific advisor to the Supreme Allied Command and was named Weapons Physics Division leader.

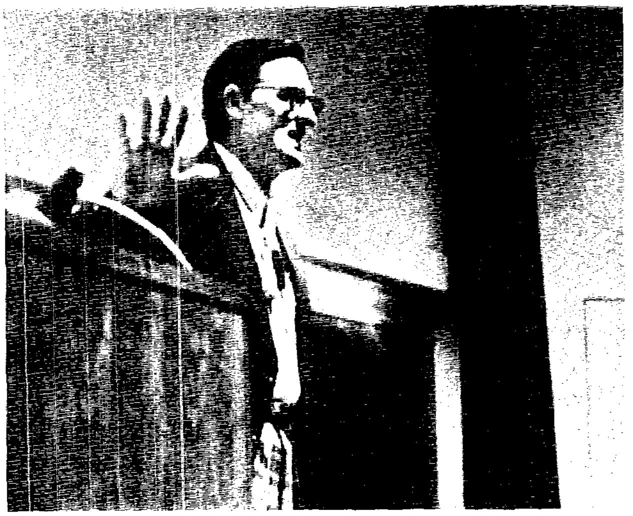
Some 40 staff members and technicians participated in the nation's first test readiness exercise in the Pacific, using for the first time the AEC/USAF NC-135 that was to become LASL's flying laboratory, and over 50 Los Alamos youths competed in the city's first Soap Box Derby.

Also "making the scene" in 1964 was the first issue of *The Atom*, successor to the *LASL News*, and most of the 10-year service pin recipients listed below:

Archuleta, Leo P., C-1
Armstrong, Elza W., SP-10
Armstrong, Junior C., M-4
Barner, John O., CMB-11
Barnhart, Benjamin, H-9
Baughman, William J., CMB-1
Biddy, Barbara L., C-1
Bouchard, William T., WX-3
Bronnenkant, John R., SD-5
Builta, Lee A., M-2
Buxton, Warren H., M-2
Chelius, Leo G., Jr., C-1
Claybrook, Ruth J., MP-7
Clinard, Frank W., Jr., CMB-5
Coburn, Michael D., WX-2
Collier, Lionel P., E-1
Colston, Elbert W., SD-4
Cox, Clarice W., C-8
Cushing, Steven B., MP-11
Dabney, Jean L., P-4
Davenport, Ray, C-3
Debusk, Thomas P., CNC-11
Di Marco, Joseph N., CTR-2
Doss, James D., MP-3
Duran, Joseph E., SD-5
Dussart, John A., MP-DO
Ebaugh, Larry R., CMB-7
Edwards, Millard R., CNC-11
Elkins, E. Paul, MP-1
Enger, Merlin D., H-9
Espinoza, Antonio D., WX-3
Fisher, Henry N., Q-23
Forest, Charles A., TD-6
Garde, Raymond, H-8
Gerke, David G., J-14
Getzinger, Richard W., L-3
Gonzales, Luis A., SD-5
Gray, Alton J., CMB-6
Greiner, Norman R., L-3
Griego, Eligio C., WX-3
Guenther, Alvin H., CMB-AS
Gurley, Lawrence R., H-9
Hampton, Velta R., ADW-PM
Hansen, Bernard H., ENG-4
Hardin, Julia M., H-9
Harris, Harlan W., CTR-4
Harvey, Joyce A., C-DO
Helland, William R., Sr., MP-7
Herrera, Benjimen A., CMB-1
Hulette, Jean F., A-3
Kelley, Patricia A., E-DO
Kewish, Ralph W., Jr., CTR-4
Koenig, Daniel R., Q-DOT
Kramer, Paul M., H-9
LaRotonda, James J., ENG-2
Law, Delman A., WX-6
Lawrence, George P., P-11
Lehman, Hugh R., ADWP-1
Leonard, Thomas E., CMB-AS
Lujan, Marcial R., CMB-6
Lupardus, Buckley D., ENG-2
Machen, Donald R., MP-1
Maestas, Lugarda A., SP-3
Mahan, James M., ISD-3
Maier, William B., II, L-3
Malmberg, Carol R., ISD-4
Martinez, Aaron M., H-9
Matheson, Alice B., AO-4
Michael, Donald E., M-4
Mick, Charles W., CMB-7
Miller, Janice N., C-2
Montano, Raphael A., CMB-5
Montgomery, Michael D., P-4
Montoya, Fred J., C-1
Moore, Stanley W., Q-DOT
Morris, Duard I., MP-9
Munyon, Mary Jane, C-1
Myers, Donald R., E-2
Newell, Robert H., MP-11
Nogar, Andrew R., SD-5
O'Neal, Martha J., TD-7
Paiz, Patrick E., SD-5
Pettit, William R., ENG-2
Ramsey, Charles W., ENG-4
Reese, Charles D., M-4
Rodenz, Gary W., M-2
Roybal, Ramona Alice, AO-5
Roybal, Sylvia T., SP-11
Royer, George W., H-5
Ruppel, Hans M., T-3
Rupprecht, Robert G., CMB-7
Sanchez, Joe M., SD-1
Seeger, Philip A., P-11
Sembach, Hans J., CMB-7
Shera, E. Brooks, P-2
Shilling, Sharon I., SD-1
Skaggs, Samuel R., CMB-3
Smith, David A., H-9
Snow, Edward C., CMB-5
Stephens, Faith I., ISD-1
Sterner, Donald F., ENG-DO
Stibbard, Norma I., P-4
Stice, Richard L., CNC-11
Swenson, Donald A., MP-9
Szalay, Gerard, ENG-10
Tegtmeier, Jeanette H., C-DO
Thomas, Keith S., CTR-7
Thomas, Michael S., CTR-8
Tobey, Robert Allen, H-9
Turner, William C., Q-23
Valdez, Joseph G., H-9
Volz, James L., WX-3
Wampler, LeRoy S., SD-1
Ward, Evelyn I., ISD-4
Wickline, Donald M., SD-1
Williams, Harry E., MP-1
Wooten, Mary Sue, ISD-2
Workman, William S., E-2

Among Our Guests

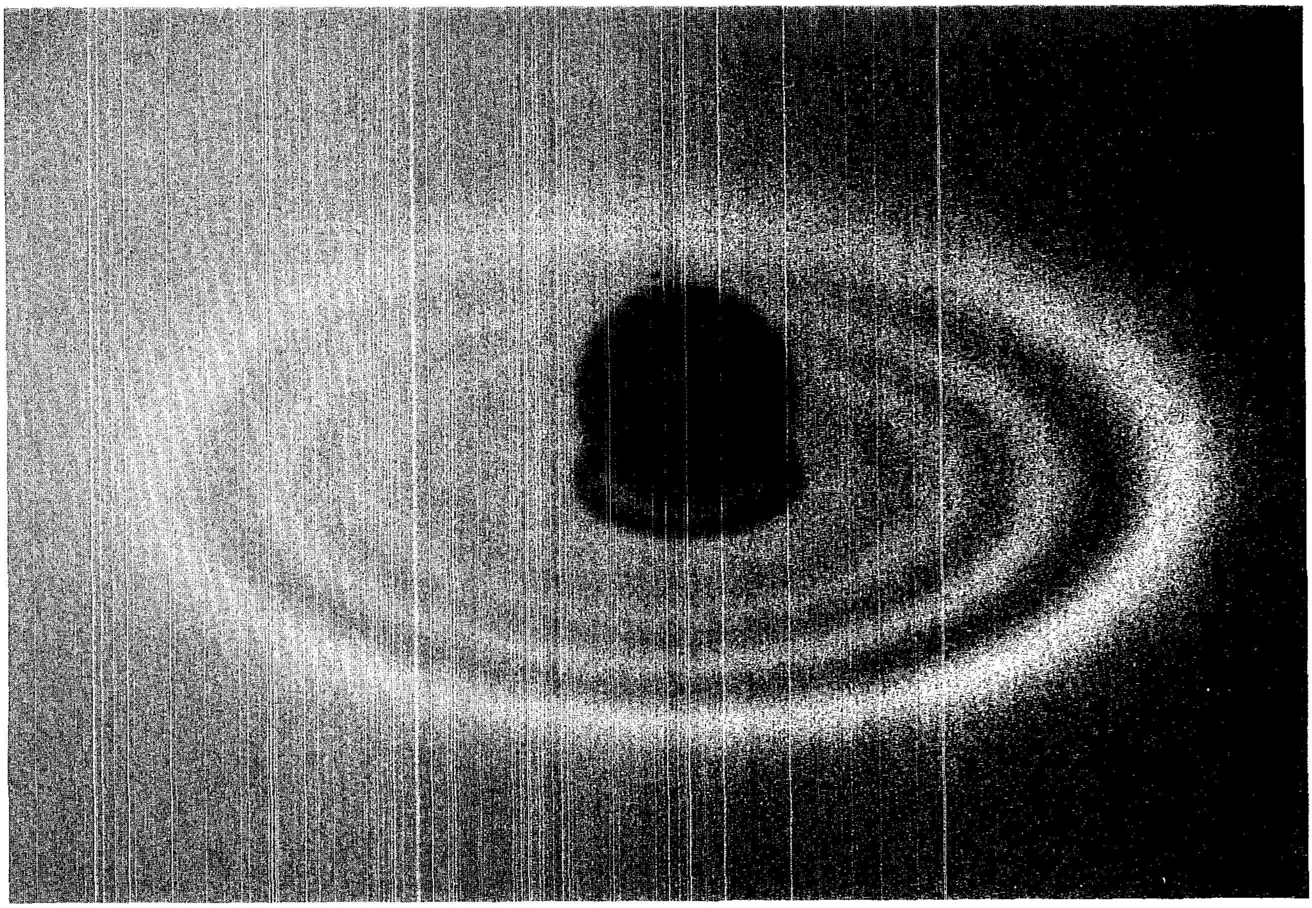
Kenneth Cooper, developer of the "Aerobics Physical Fitness Program" while a U.S. Air Force medical officer, and author of books on the subject, spoke at a standing-room-only colloquium at LASL in February. So persuasive was Cooper on the virtues of physical fitness that LASL employees in droves turned out to jog with Cooper (dark suit, right) following the program.



Alan Swain, technical director of the Human Factors Group at Sandia Laboratories, Albuquerque, was the principal speaker at the Shop Department's Spring Safety Meeting attended by 300 on March 5. Swain discussed human elements in safety.

Major General Ernest L. Graves, director of the Division of Military Application for ERDA, at LASL to visit Director Harold Agnew, found himself unexpectedly accompanying Agnew to the Administration Building auditorium to honor 11 graduates of the Department's Machinist Apprenticeship Program. The general gladly participated in handing out the certificates. Left to right: Agnew, Graves, Frank Stack, Shop Department head, and Albert Delgado, training supervisor for the Program.

Hans Bethe, left, chats with Robert Duffield, Q-Division leader, right, before speaking on energy problems in the Administration Building auditorium on January 28. Bethe played a prominent role in weapons development at Los Alamos during World War II, has been awarded a Nobel prize and Fermi Award, among other honors, and is professor of physics at Cornell University.



Not the rings of Saturn nor the waves formed as a stone is dropped into water, but a metal-coated glass micro-balloon no bigger than a speck of dust made by Group L-4 as a target for laser-fusion experiments (The Atom, November-December 1974). The rings are the result of interference effects of the light passing through the thin polyethylene film to which the gas-filled pellet is attached. The micro-photograph was made by Gene Lamkin, L-2, who also took the photo of the pellet on a hair shown in the November-December issue of The Atom.